2009 Groundwater Quality Report

Santa Clara Valley Water District

Groundwater Monitoring and Analysis Unit

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Executive Summary

The Santa Clara Valley Water District (District) monitors groundwater quality in the Santa Clara, Coyote, and Llagas Subbasins in support of Board Water Supply Objective 2.2.1: "*Protect groundwater basins from contamination and the threat of contamination.*" The primary objectives of this monitoring are to evaluate groundwater quality against established water quality objectives and to provide information to protect the long-term viability of the resource. The majority of wells within Santa Clara County produce high-quality water that meets drinking water standards, and the continued evaluation of regional quality and potential threats helps to ensure high-quality groundwater will continue to be available.

This 2009 Groundwater Quality Report includes an evaluation of water quality data from 94 wells sampled by the District and 211 wells sampled by water suppliers during calendar year 2009. This includes the following for each subbasin: general evaluation of water quality conditions; comparison of 2009 water quality data to drinking water standards and agricultural objectives; and analysis of water quality trends of nitrate, total dissolved solids, and chloride over the last 10 years. As the Santa Clara and Llagas Subbasins have significant confining layers, data for these subbasins is also analyzed for both the shallow and principal aquifer zones.

The 2009 median concentrations for common inorganic constituents are generally well below California Department of Public Health (CDPH) drinking water standards and Regional Water Quality Control Board agricultural water quality objectives for each subbasin and aquifer zone. Exceptions are nitrate (the median concentration in the Llagas Subbasin shallow zone exceeds the primary, health-based standard) and manganese (the median concentration in the Santa Clara Subbasin shallow zone exceeds the secondary, aesthetic-based standard).

Table ES-1 summarizes which constituents were detected above primary, health-based standards (Maximum Contaminant Levels, or MCLs) in 2009: aluminum, arsenic, barium, nitrate, and perchlorate. For the wells analyzed in this report, primary drinking water standards were exceeded at the following percentage of wells tested: nitrate (8%); perchlorate (2%); and aluminum, arsenic, and barium (<1% each). Detections above MCLs occurred at both monitoring wells and water supply wells.

The following constituents were detected above secondary, aesthetic-based drinking water standards in 2009: total dissolved solids (TDS), specific conductance, manganese, iron, aluminum, chloride, sulfate, and turbidity. For the wells analyzed in this report, secondary standards were exceeded at the following percentage of wells tested: TDS (25%), manganese (23%), specific conductance (17%), iron (11%), chloride (4%), turbidity (4%), aluminum (2.5%), and sulfate (2%). It should be noted that the drinking water standards for some constituents, such as TDS, are given as a range by CDPH. For these constituents, the lowest value (recommended limit) was used in this analysis.

Table ES-1. Wells with Constituents Exceeding Primary Drinking Water Standards in 2009

Subbasin and Zone	Constituent	Notes
Santa Clara Shallow Zone	Arsenic	Arsenic was detected above the Maximum Contaminant Level (MCL) in one monitoring well.
Santa Clara Principal Zone	Aluminum	Aluminum was detected above the MCL at one public water supply well. Subsequent testing did not confirm the elevated level.
Coyote	Nitrate	Nitrate was detected above the MCL at 2 water supply wells and one domestic supply well.
Llagas Shallow Zone	Nitrate	Nitrate was detected above the MCL at 6 monitoring wells.
Llagas Principal Zone	Nitrate Barium Perchlorate	Nitrate was detected above the MCL at 5 water supply wells (4 public), 6 domestic wells, and 2 monitoring wells. Barium was detected above the MCL at 1 monitoring well. Perchlorate was detected above the MCL at 3 public water supply wells.

Note: For public water supply wells with constituents detected above primary drinking water standards, blending or treatment is required prior to delivery to customers.

Elevated nitrate concentrations are an ongoing groundwater protection challenge in the Coyote and Llagas Subbasins. The District has undertaken various efforts to define the extent and severity of nitrate contamination, identify potential sources, and reduce nitrate loading. The District also continues to monitor progress of the cleanup of the perchlorate plume in the Llagas Subbasin, which has impacted a number of private wells.

Comparison of 2009 data against the respective agricultural objectives in the Regional Water Quality Control Board Basin Plans indicates relatively few instances where constituents were detected above objectives for wells located in the Santa Clara and Coyote Subbasins. In the Llagas Subbasin, 28% of wells tested for specific conductance exceeded the lowest threshold. However, no wells exceeded the upper limit. District staff will continue to monitor potential changes in specific conductance and other constituents exceeding objectives.

Trend analyses for TDS, chloride, and nitrate were conducted using ten years of data (2000-2009). Trend was analyzed at all wells having at least four results for a given constituent over the ten-year period, so the number of wells analyzed for trend varied by subbasin and zone. For the wells analyzed county-wide for trend, there were upward trends for the following percentages of wells: nitrate (8%), TDS (4%), and chloride (3%). For the wells analyzed county-wide for trend, there were downward trends for the following percentages of wells: nitrate (10%),

chloride (7%), and TDS (2%). The remaining wells (majority of wells) did not indicate clear evidence of trends. Trends varied by constituent, subbasin, and aquifer zone.

Analysis of 2009 groundwater quality data from monitoring performed by the District and water suppliers indicates that groundwater in Santa Clara County generally meets drinking water standards without additional treatment. The most notable water quality issues continue to be nitrate and perchlorate, primarily in the Llagas Subbasin. The trend analysis using data from 114 wells from 2000 to 2009 indicates that in the Llagas Subbasin, nitrate is decreasing in 14% of the wells, increasing in 11% of wells, and showing no trend in 75% of wells analyzed for trend.

The detections above drinking water standards noted in this report present a challenge to water suppliers and private well owners who may need to blend or treat the water prior to delivery or use. However, in general, the three subbasins produce high-quality water and the majority of wells meet drinking water standards without the need for treatment. The District will continue to collect and analyze groundwater quality data to characterize groundwater quality, determine the severity and extent of contamination, and evaluate changes in water quality over time to help ensure the groundwater basins are aggressively protected from contamination and the threat of contamination.

1.0 Introduction

1.1 Background

The Santa Clara Valley Water District (District) monitors groundwater quality as part of its groundwater management activities in support of Board Water Supply Goals 2.1: *"Reliable water supply"* and 2.2: *"High quality water supply"* and the related Water Supply Objective 2.2.1: *"Protect groundwater basins from contamination and the threat of contamination."*

The overall objectives of groundwater quality monitoring are to evaluate groundwater quality against established water quality objectives and to provide information to protect the long-term viability of the resource. Specific goals of the groundwater quality monitoring program are to: 1) characterize regional groundwater quality conditions, 2) determine the severity and extent of any contamination, 3) evaluate temporal trends in water quality, and 4) identify any threats to groundwater quality and determine where further study or action is warranted to protect groundwater resources.

1.2 Purpose

This 2009 Groundwater Quality Report summarizes the results of groundwater quality monitoring conducted in Santa Clara County (County) during calendar year 2009. This includes results of the District's monitoring program data and other monitoring data acquired through the California Department of Public Health (CDPH) water quality database which contains data from water suppliers, including water retailers, mutual water systems and municipalities. The use of these two data sources provides an improved spatial distribution of sampling points (wells) for the evaluation of regional groundwater quality conditions and helps to minimize District sampling costs.

Using 2009 groundwater quality data collected by the District and water suppliers, this report will evaluate the following:

- General groundwater quality conditions based on major and minor ions, nutrients, trace elements, volatile organic compounds, pesticides, and radionuclides.
- Groundwater quality as compared to drinking water standards
- Groundwater quality as compared to agricultural objectives
- Water quality trends for select constituents (nitrate, total dissolved solids, and chloride) over the last ten years

1.3 Report Organization

This report is organized into 5 sections including this introduction. Section 2 provides a brief description of the study area and summarizes the number and types of wells tested by both the District and water suppliers. Section 3 discusses results of monitoring organized according to water quality constituent groups. Trends in select constituents over the last decade are discussed in section 4. Lastly, section 5 provides a summary of the entire report.

2.0 Summary of 2009 Groundwater Quality Monitoring

2.1 Study Area and Generalized Hydrogeology

Santa Clara County harbors significant groundwater resources beneath its flat valley regions. This resource has been drawn upon since the late nineteenth century and currently provides about half of all water used in the County. Groundwater is pumped from layers of loose sand and gravel that have washed in from adjacent highlands by erosion, filling an alluvial basin under the wide, relatively flat valley floor. The valley floor is divided into three groundwater subbasins – Santa Clara, Coyote, and Llagas. The Santa Clara and Llagas Subbasins have laterally extensive low-permeability units, which form confining layers and separate the subbasins into confined zones and unconfined zones (or recharge areas) as shown in Figures 2-1 and 2-2.

For the purposes of this report, the Santa Clara and Llagas Subbasins are further divided into shallow and deep aquifer zones. The vast majority of water used within the County is pumped from the deeper aquifer zone, which will be referred to as the principal aquifer zone throughout this report. For the purposes of this analysis and report, wells with a total depth greater than 150 feet are assumed to represent the principal aquifer zone. It should be noted that the concept of shallow and principal aquifer zones is not strictly applicable in unconfined or recharge areas. However, the general categorization is still worthwhile in that it allows for the separate evaluation of water quality from very shallow zones and from the deeper zones that are more commonly drawn upon for beneficial use. Figures 2-1 and 2-2 illustrate the wells sampled by both the District and by water suppliers in 2009.

2.2 District Monitoring

The District collected groundwater quality samples from 94 wells in September and October 2009. The wells sampled represent a mix of dedicated monitoring wells and private domestic water supply wells. To evaluate regional groundwater quality conditions and assess changes in quality, the District analyzed samples for major and minor inorganic compounds, volatile organic compounds, and other commonly included parameters such as nitrate, total dissolved solids (TDS), and specific conductance (or electrical conductivity [EC]). See Appendix A for a complete list of parameters analyzed by the District. Samples were collected in accordance with widely accepted procedures for groundwater sample collection, filtering, preservation, and handling. The District provided a copy of the laboratory results for each well sampled by the District to the respective well owner.

2.3 Water Supplier Monitoring

Each year, the District acquires data from CDPH which includes the results of monitoring undertaken by the County's water retailers and other water suppliers for compliance with CDPH regulations. For 2009, the CDPH database has data on 222 wells within the County that were sampled and analyzed for a wide range of constituents; however, only 211 wells were used in this evaluation because 11 wells were outside the limit of the groundwater subbasins. In

general, the CDPH wells used in this evaluation are high capacity production wells with multiple screens drawing water from numerous individual aquifer zones. In addition to those parameters analyzed under the District's program, the CDPH data contains information on radionuclides, and semi and non-volatile organics (pesticides), and some currently unregulated contaminants as required by California Title 22 drinking water regulations. Tables 3-7 through 3-12 provide a complete listing of all parameters compiled into the 2009 dataset.

2.4 Summary of Wells Sampled

A summary of the number of wells sampled in each subbasin by both the District and water suppliers is shown below in Table 2-1. It should be noted that not every well is sampled for the same constituents. Although most wells within the District's groundwater quality monitoring network are sampled for all the parameters listed in Appendix A, some wells are only sampled for select constituents of concern such as nitrate or chloride. Water quality data from the CDPH database represents data reported by the water suppliers for compliance purposes. As CDPH monitoring frequency varies based on the status of the well and previous results, water quality data for these wells also varies in terms of constituents analyzed.

Table 2-1. Number of Wells Sampled for Each Subbasin

Subbasin	Wells Sampled by District	Wells Sampled by Water Suppliers	Total
Santa Clara Shallow Aquifer Zone	23	0	23
Santa Clara Principal Aquifer Zone	21	158	179
Coyote	6	15	21
Llagas Shallow Aquifer Zone	11	0	11
Llagas Principal Aquifer Zone	33	38	71
Total	**94**	**211**	**305**

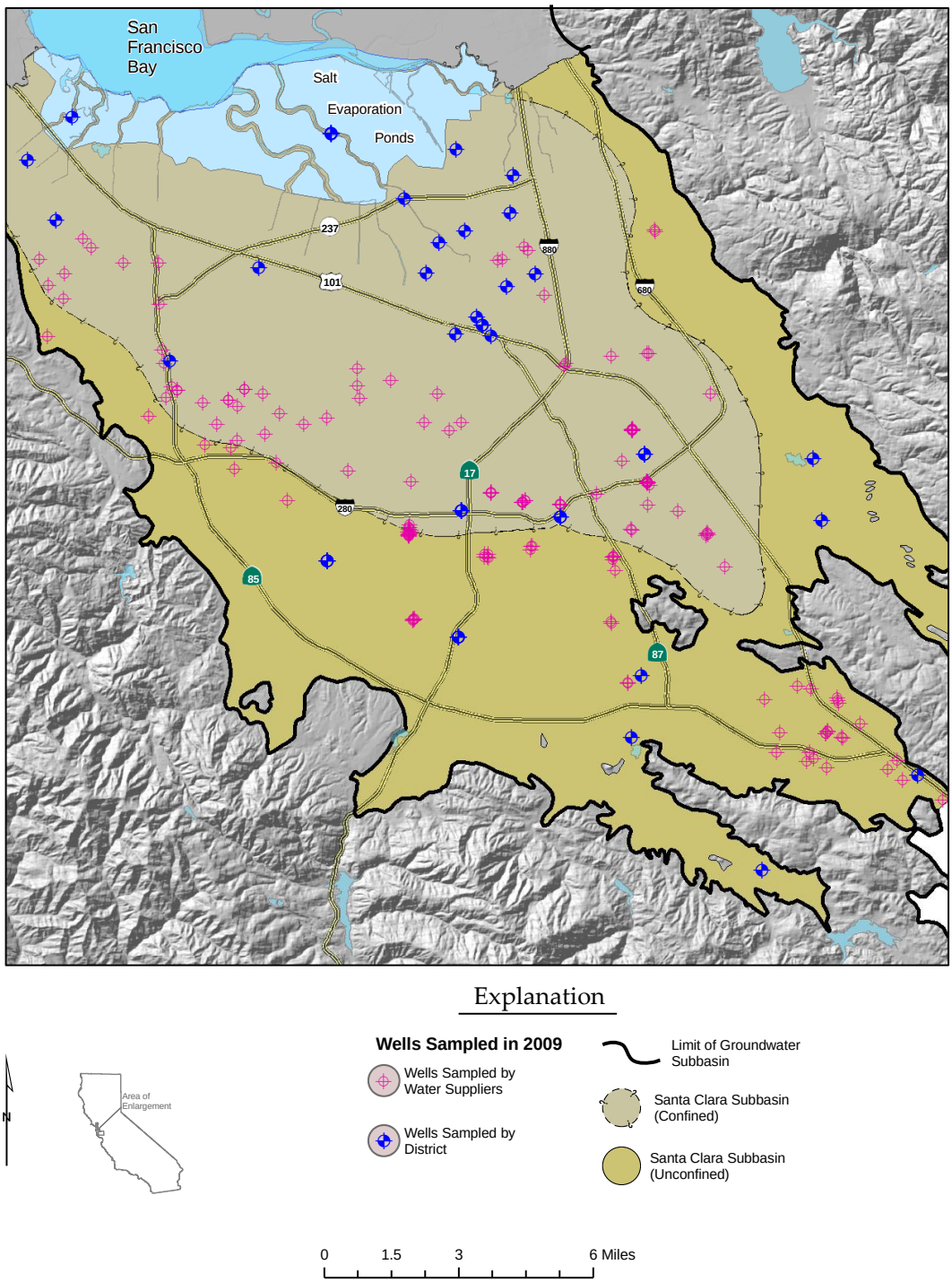

Figure 2-1. Location of Wells Monitored in 2009
Santa Clara Subbasin

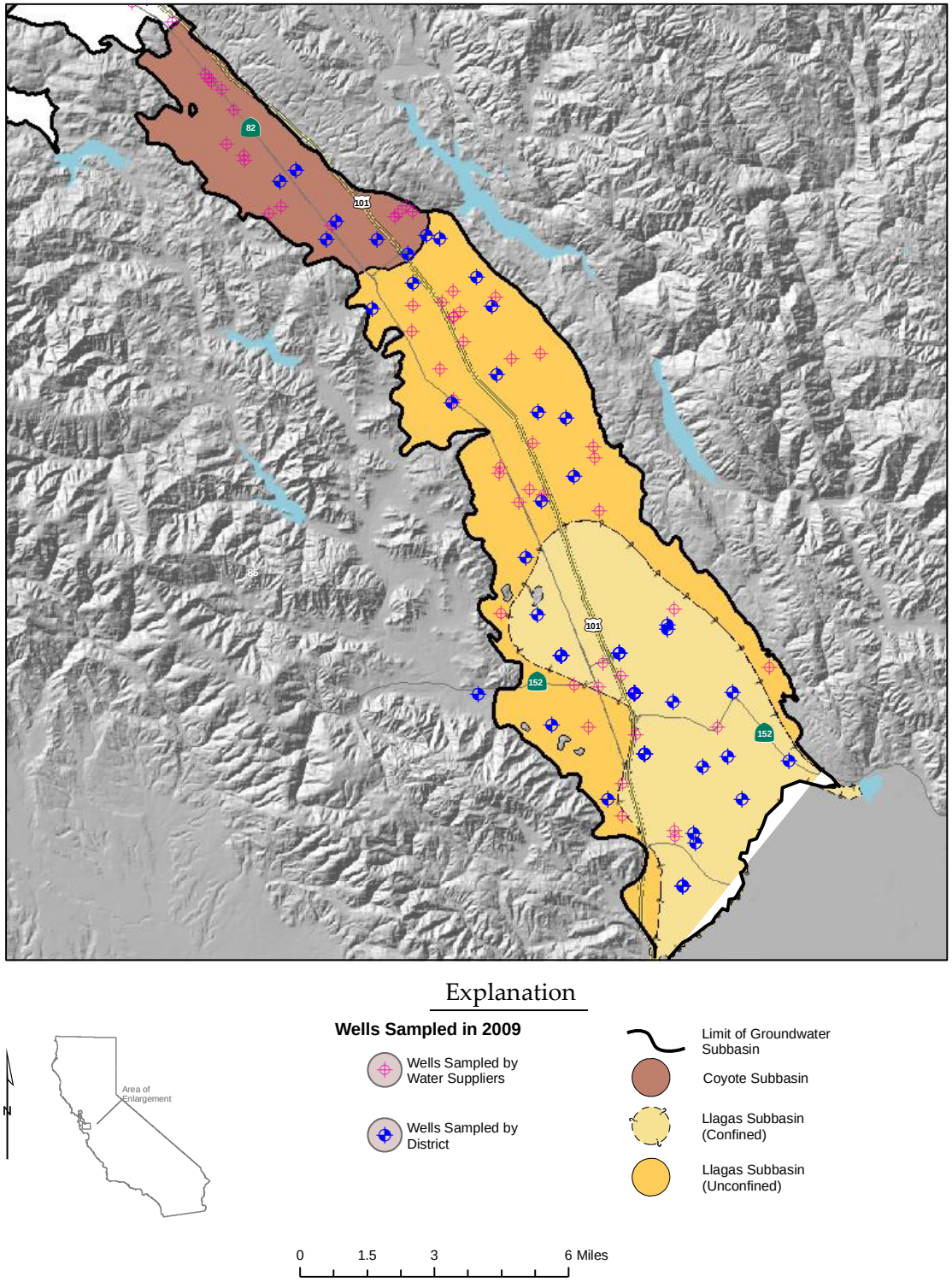

Figure 2-2. Location of Wells Monitored in 2009
Coyote and Llagas Subbasins

3.0 Groundwater Quality – 2009 Status

Groundwater quality in Santa Clara County's three groundwater subbasins was monitored in the fall of 2009 by the District and throughout the year by the various local water suppliers. Groundwater samples were analyzed for a large number of organic substances (volatile organic compounds [VOCs], semi-VOCs, pesticides, and pesticide degradation products), naturally occurring inorganic constituents (major ions, nutrients, and trace elements), radioactive constituents, and miscellaneous water quality indicators.

3.1 Interpretation of Groundwater Quality Results

The results of groundwater sample analyses are described briefly in the following sections. Unlike public water suppliers who sample for compliance purposes, the District samples groundwater to assess regional conditions. Concentrations in groundwater are compared to CDPH health-based and aesthetic thresholds as a way to provide context for the results presented in this report. Concentrations are also compared to thresholds for agricultural use established by the San Francisco Regional Water Quality Control Board (SFRWQCB) and the Central Coast Regional Water Quality Control Board (CCRWQCB).

It should be noted that the identification of any constituent above regulatory standards in this report does not necessarily indicate the delivery of unsafe water to consumers as public water suppliers are required to meet drinking water standards, which may require blending or treatment prior to delivery. The following thresholds are used for comparison:

- **Maximum Contaminant Level - MCLs.** These are enforceable standards designed to protect public health by limiting the amount of contamination in drinking water that apply to public water systems. MCLs established by the US Environmental Protection Agency (USEPA) are the minimum standards to which states must adhere, although individual states may adopt more stringent standards, as California has done for some contaminants. CDPH has also set MCLs for a few contaminants not regulated by USEPA. In this report, concentrations are compared to the more stringent standard. Although there are no MCLs for lead and copper, concentrations were compared to action levels, as defined in the CDPH Lead and Copper Rule.

- **Secondary Maximum Contaminant Level - SMCLs.** Secondary Maximum Contaminant Levels (SMCLs) address aesthetic issues related to taste, odor, or appearance of the water and are not related to health effects. In general, SMCLs established by CDPH are used in this report**.** For one constituent, pH, results are compared to the USEPA SMCL since CDPH does not have a threshold. Concentrations of sulfate, chloride, total dissolved solids, and specific conductance, are compared to both a "recommended" and an "upper" SMCL as identified by CDPH.

- **Basin Plan Agricultural Objectives.** The Regional Water Quality Control Boards have established thresholds for agricultural use (including irrigation, farming, etc) in Basin Plans. In this report, concentrations are compared to agricultural water quality objectives in the

Basin Plan for the San Francisco Bay Region (for the Santa Clara and Coyote Subbasins) and the Central Coast Region (for the Llagas Subbasin).

All comparison thresholds used in this report are presented in Tables 3-7 through 3-12.

3.2 Water Quality Results

Groundwater samples collected in Santa Clara County were analyzed for approximately 250 chemical constituents; the District's sampling effort quantified 108 individual chemical constituents. All constituents are grouped into one of 4 broad chemical groups, or classes as presented in Table 3-1, below. This section of the report will discuss results of monitoring for each of the chemical classes separately.

Figures 3-1 and 3-2 illustrate the geographic locations of wells with constituents detected above drinking water standards in 2009.

Table 3-1. Classes of Constituents Sampled in Calendar Year 2009

Constituent Class	Constituent list table
Water Quality Indicators	
Alkalinity	3-7
Color	3-7
Foaming agents (MBAS)	3-7
Hardness as $CaCO_3$	3-7
Odor threshold @ 60C	3-7
pH	3-7
Specific Conductance	3-7
Turbidity	3-7
Temperature	3-7
Organic Constituents	
Volatile organic compounds	3-8 & 3-9
Pesticides and pesticide degradation products	3-10
Inorganic Constituents	
Major and minor ions	3-11
Trace elements	3-11
Nutrients	3-11
Radioactive Constituents	
Gross alpha radiation	3-12
Gross beta radiation	3-12
Radium 226	3-12
Radium 228	3-12

In the following sections, detected water quality indicators and chemical constituents are identified and tabulated. Also presented is the number of wells with detections greater than health-based or aesthetic-based thresholds.

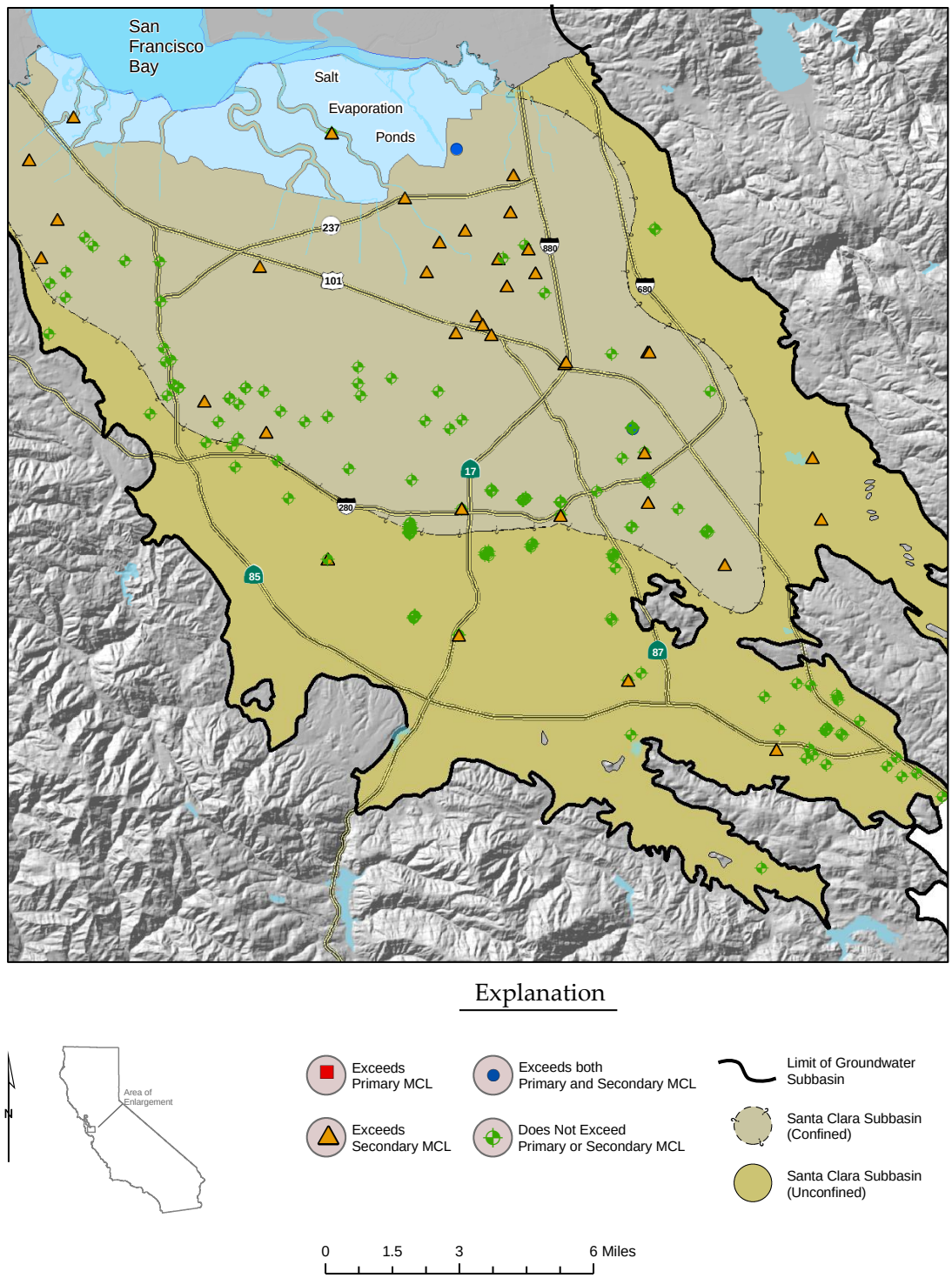

Figure 3-1. Wells with Constituents Detected Above Drinking Water Standards in 2009 Santa Clara Subbasin

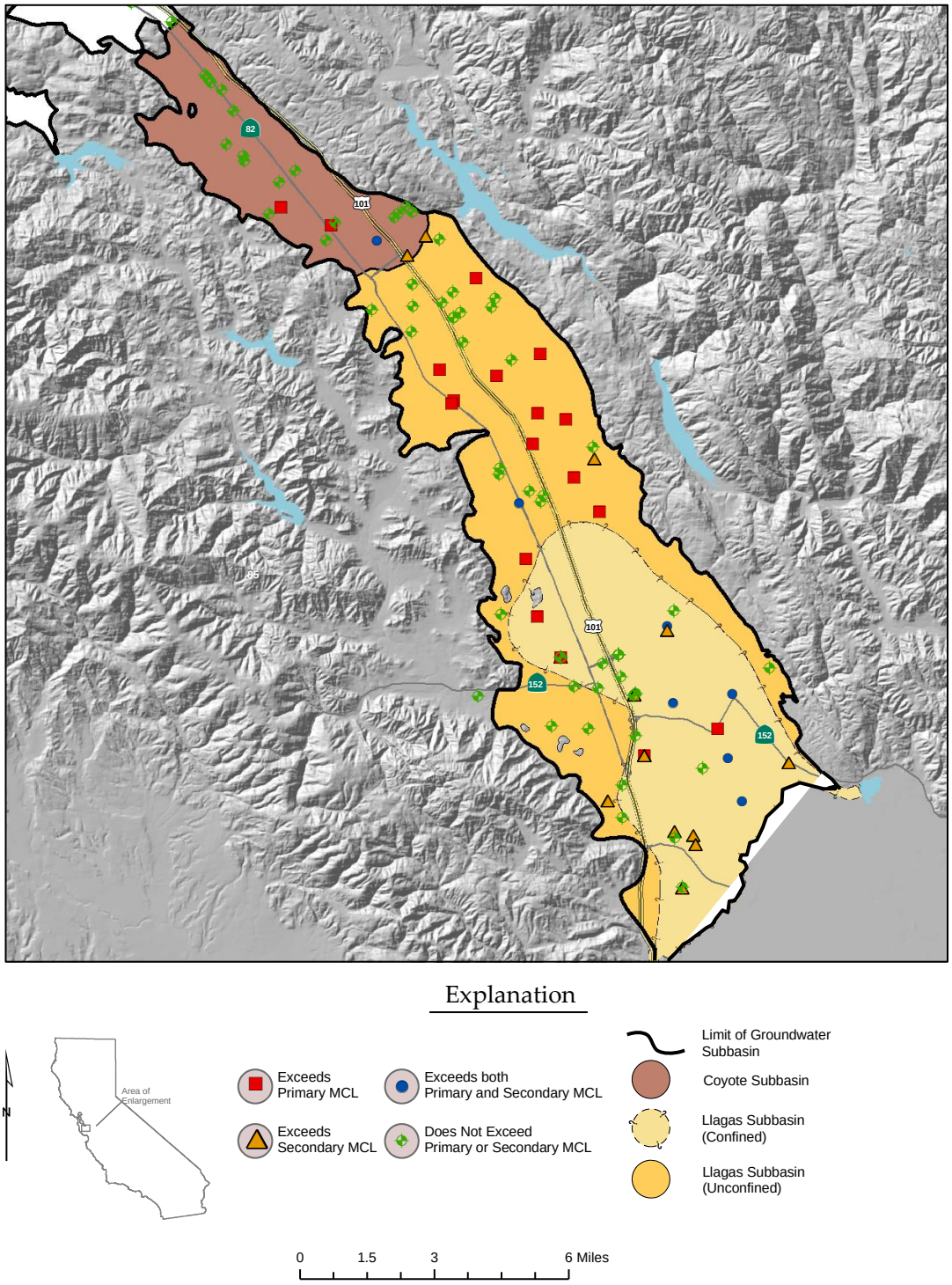

Figure 3-2. Wells with Constituents Detected Above Drinking Water Standards in 2009 Coyote and Llagas Subbasins

3.2.1 Water Quality Indicators

For this report, water quality indicators are defined as those physical and aggregate properties of water that are not specific to individual chemical compounds or elements, yet provide an indication of the overall quality of water. They are listed in Table 3-7 along with their regulatory comparison thresholds. None of the constituents in this group have established health-based thresholds, although many do have aesthetic-based thresholds.

Of the more important indicators, alkalinity is a measure of the waters ability to neutralize acid and plays an important role in the natural processes that affect water quality. Specific conductance is a measure of the waters ability to conduct an electrical current at a specific temperature (25°C) and directly correlates to the amount of dissolved mineral salts in water. The acidity and basicity of water is measured by pH, which, like alkalinity, controls various processes affecting water quality, most notably the ability of water to dissolve substances. There are no aesthetic-based thresholds for hardness; however, hardness is important aspect of quality both in the domestic and industrial setting. Hardness results from multivalent metal cations, notably calcium and magnesium. Hard water is not desirable as it can react with soap forming insoluble and unattractive residues on fixtures, in addition to limiting heat transfer in boilers.

Specific conductance was measured above the CDPH SMCLs recommended value in a total of 32 wells (17% of wells tested). Ten wells had a specific conductance value greater than the CDPH recommended upper level (1600 microSiemens per centimeter (μS/cm). Typically these wells are shallow aquifer zone monitoring wells not used for domestic or municipal supply and are about evenly distributed between the Santa Clara and Llagas Subbasins. No wells in the Coyote Subbasin had specific conductance above either the recommended (900 μS/cm) or upper (1600 (μS/cm) SMCLs.

Turbidity was measured above the SMCLs in 6 wells; 4 of which are located in the Santa Clara Subbasin, and two in the Llagas Subbasin. None of the wells having turbidity greater than SMCLs are used for domestic or municipal supply. No other water quality indicator parameters were detected above applicable thresholds. A summary of only those water quality indicators detected above comparison thresholds is presented below in Table 3-2.

Table 3-2. Summary of Water Quality Indicators Detected above Drinking Water Thresholds

Constituent	Number of wells analyzed	Number of wells above threshold[1]	MCL[2]	SMCL[3]
SANTA CLARA SUBBASIN – Shallow Aquifer Zone				
Specific Conductance (μS/cm)	23	15 (7)	--	900 (1600)
Turbidity (NTU)	23	2	--	5
SANTA CLARA SUBBASIN – Principal Aquifer Zone				
Specific Conductance (μS/cm)	81	7 (1)	--	900 (1600)
Turbidity (NTU)	73	2	--	5
COYOTE SUBBASIN				
Specific Conductance (μS/cm)	9	1 (0)	--	900 (1600)
LLAGAS SUBBASIN – Shallow Aquifer Zone				
Specific Conductance (μS/cm)	11	5 (0)	--	900 (1600)
Turbidity (NTU)	11	1	--	5
LLAGAS SUBBASIN – Principal Aquifer Zone				
Specific Conductance (μS/cm)	60	4 (2)	--	900 (1600)
Turbidity (NTU)	41	1	--	5

Notes: μS/cm = microSiemens per centimeter; NTU = Nephelometric Turbidity Units
Shallow Zone = wells with total depth less than 150 feet. Principal Zone = wells with total depth greater than 150 feet.

1. The number of wells with detections above the recommended threshold is listed, with the number of wells with detections above the upper threshold shown in parentheses.
2. MCL = Maximum Contaminant Level, or health-based standard, set by the California Department of Public Health (CDPH).
3. SMCL = Secondary Maximum Contaminant Level, or aesthetic-based standard, set by the CDPH. For SMCLs having a range, the lower, recommended threshold is listed, with the upper threshold shown in parentheses.

3.2.2 Organic Constituents

Volatile Organic Compounds (VOCs) and Semi VOCs

Volatile organic compounds are used extensively in everyday life including in paints, solvents, motor fuel, fuel additives, fumigants, and refrigerants. A total of 91 individual VOCs were analyzed in 2009. Twenty four other non-volatile or semi-volatile organic compounds have been grouped together with the VOCs for practical purposes (Table 3-8). These include polycyclic aromatic hydrocarbons, plasticizer, explosives, and feedstock chemicals used for the manufacture of various other chemical compounds and products. For simplicity, all 115 chemical compounds in this constituent grouping are referred to as VOCs. Of these VOCs, 103 were not detected in any samples. Twelve VOCs were detected above laboratory reporting levels, although all detections were below MCLs and SMCLs. The most frequently detected VOCs are acetone, total trihalomethanes, and 1,1,1-trichloroethane. The number of wells with reported detections, maximum concentration detected and comparison thresholds for each of the 12 VOCs are shown below on Table 3-3. Table 3-9, located at the back of the report, summarizes the VOC detections according to subbasin and aquifer zone.

Table 3-3. Number of Wells with Reported Detections of VOCs

Constituent	Number of wells with detection	Number of wells analyzed	Maximum concentration detected (μg/L)	MCL[1] (μg/L)
1,1,1-Trichloroethane	9	190	3.9	200
1-1-2-Trichloro-1-2-2-Trifluoroethane (Freon 113)	4	190	14	1200
1-1-Dichloroethylene	3	189	3.4	6
Acetone	1	13	5	NA
Bromodichloromethane (THM)	1	151	0.51	NA[2]
Bromoform (THM)	3	152	9.85	NA[2]
Chloroform (THM)	2	152	16.1	NA[2]
Chloromethane	1	129	0.51	NA[2]
Dibromochloromethane (THM)	2	151	1.63	NA[2]
Tetrachloroethylene	2	190	2.8	5
Total Trihalomethanes	2	34	12	80
Trichloroethylene	1	190	0.9	5

Notes: μg/L = micrograms per liter, equivalent to 1 part per billion

1. MCL = Maximum Contaminant Level, or health-based standard, set by the California Department of Public Health (CDPH).

2. No individual MCLs established; Total Trihalomethanes not to exceed 80 μg/L.

Pesticides

Pesticides include herbicides, insecticides, and fungicides used to control weeds, insects, fungi and other pests in the agricultural, suburban, and urban environments. The 2009 analytical results for 74 pesticides and pesticide degradation products including laboratory reporting levels are summarized in Table 3-10. No pesticides were detected above laboratory detection limits or MCLs or SMCLs. One constituent within this group has an established SMCL.

3.2.3 Inorganic Constituents

Most of the constituents in this class are derived in solution by means of natural processes including erosion and rock weathering, although their concentration in groundwater can be influenced by human activities. The constituents in this class are listed and summarized in Table 3-11 and consist of common and relatively abundant constituents (major ions), less abundant ions, nutrients, and certain elements which are present in solution, but only in minute quantities. The major ion composition, total dissolved solids (TDS), and certain trace elements affect the aesthetic qualities of groundwater including taste, color, odor, and propensity of staining and scale formation. Other constituents in this class can adversely affect human health, and in the case of nitrate, particularly the health of infants. A total of 17 constituents in this class have established health-based MCLs and 9 have aesthetic-based SMCLs. For those detections above established thresholds, a summary table according to subbasin and aquifer zone is presented in Table 3-4 below.

Table 3-4. Summary of Inorganic Constituents Detected above Drinking Water Thresholds

Constituent	Number of wells analyzed	Number of wells above MCL[1]	Number of wells above SMCL[2]	MCL	SMCL[3]
SANTA CLARA SUBBASIN – Shallow Aquifer Zone					
Arsenic (μg/L)	22	1		10	--
Chloride (mg/L)	23	--	3 (2)[1]	--	250 (500)[2]
Iron (μg/L)	23	--	2	--	300
Manganese (μg/L)	23	--	12	--	50
Sulfate (mg/L)	23	--	3 (1)	--	250 (500)
Total dissolved solids (mg/L)	23	--	15 (5)	--	500 (1000)
SANTA CLARA SUBBASIN – Principal Aquifer Zone					
Aluminum (μg/L)	80	1	--	1000	200
Chloride (mg/L)	70	--	2	--	250 (500)
Iron (μg/L)	80	--	7	--	300
Manganese (μg/L)	77	--	17	--	50
Total dissolved solids (mg/L)	70	--	8 (1)	--	500 (1000)
COYOTE SUBBASIN					
Iron (μg/L)	6	--	1	--	300
Manganese (μg/L)	6	--	1	--	50
Nitrate (mg/L)	20	3	--	45	--
LLAGAS SUBBASIN – Shallow Aquifer Zone					
Manganese (μg/L)	11	--	1	--	50
Nitrate (mg/L)	11	6	--	45	--
LLAGAS SUBBASIN – Principal Aquifer Zone					
Aluminum (μg/L)	38	--	2	1000	200
Barium (μg/L)	38	1	--	1	--
Chloride (mg/L)	38	--	2 (1)	--	250 (500)
Iron (μg/L)	38	--	7	--	300
Manganese (μg/L)	38	--	6	--	50
Nitrate (mg/L)	67	13	--	45	--
Perchlorate (μg/L)	56	3	--	6	--
Total dissolved solids (mg/L)	38	--	9 (2)	--	500 (1000)

Notes: μg/L = micrograms per liter; mg/L = milligrams per liter

Shallow Zone = wells with total depth less than 150 feet. Principal Zone = wells with total depth greater than 150 feet.

1. The number of wells with detections above the primary, health-based Maximum Contaminant Level (MCL) established by the CDPH.
2. The number of wells with detections above the CDPH recommended Secondary Maximum Contaminant Level (SMCL), or aesthetic-based standard. The number of wells with detections above the upper threshold shown in parentheses.
3. For constituents with a SMCL range, the lower recommended limit is listed, with the upper limit shown in parentheses.

Across all three subbasins, aluminum, arsenic, barium, nitrate and perchlorate were detected above their respective MCLs, with nitrate detected most frequently. Aluminum, chloride, iron, manganese, sulfate, and TDS, were all detected above their respective SMCLs. Perchlorate was detected above the MCL in 3 wells in the Llagas Subbasin principal zone.

For the reasons explained in the following sections, constituents of particular interest are chloride and nitrate. These sections provide more detailed information on the occurrence of these constituents and provide a more detailed summary of the data analyzed.

Chloride and Saltwater Intrusion

Saltwater intrusion of the Santa Clara Subbasin shallow aquifer zone adjacent to the southern shore of the San Francisco Bay has been studied and monitored for many years by the District. Although the intrusion has been somewhat widespread in the shallow aquifer zone, on the basis of historic data, it does not appear that the lower aquifer has been affected significantly.

Chloride concentrations at salinity monitoring wells are shown on Figure 3-3 for the shallow aquifer zone of the Santa Clara Subbasin. Iso-concentrations of 100 milligrams per liter (mg/L), which indicates the first signs of saltwater contamination (SCVWD, 1980), and the SMCL of 250 mg/L are also shown for wells in the eastern subbasin (there is insufficient data to make accurate contours to the west). One sample collected from the shallowest well in a cluster of three wells located in the salt evaporation ponds had a concentration of 20,600 mg/L. The two other wells from this site are deeper (greater than 150 feet) and their sample results are both 11 mg/L indicating the absence of saltwater impacts in the principal zone at this location.

Saltwater intrusion is only possible when a body of saline water is in close proximity to freshwater aquifers. Since no other bodies of saline water exist in the County other than the San Francisco Bay, the other subbasins are not prone to this type of degradation. Many of the wells are showing a downward trend in chloride, suggesting that conditions are improving in the shallow aquifer zone. On the basis of historical information, the principal aquifer zone appears to have been affected only minimally. However, there are only two active principal zone wells in the previously affected area available for testing, so it is not known whether conditions in this portion of the principal aquifer zone have changed significantly.

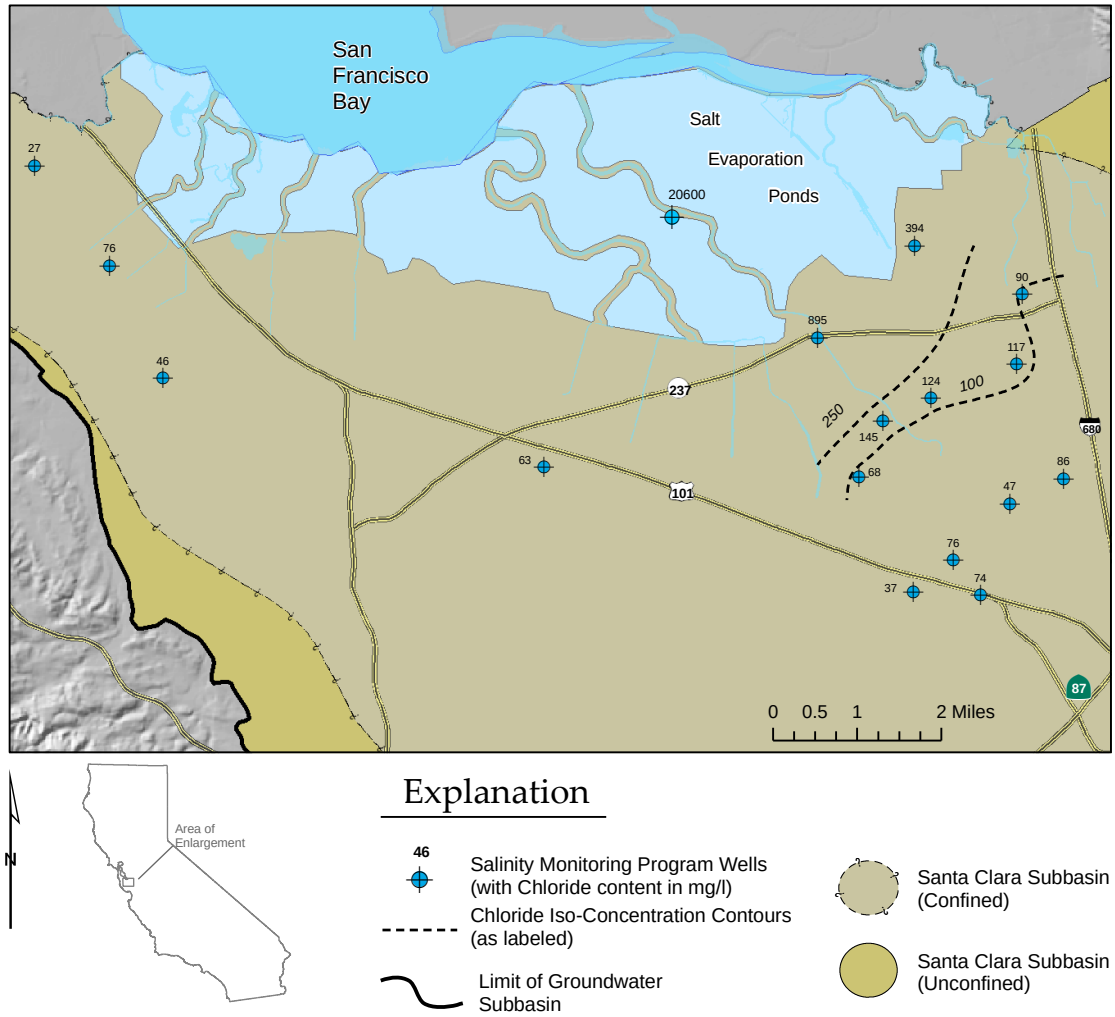

Figure 3-3. Chloride Iso-Concentration Contours
Santa Clara Subbasin

Nitrogen

Nitrogen is a particularly important constituent within the inorganic constituent group. It is present in a number of wells, in the form of nitrate, at concentrations above the MCL. Nitrogen compounds are part of a large cycle involving the production and breakdown of nitrogen (N_2) gas, nitrite, nitrate, and ammonia. Soil bacteria play an important role in converting atmospheric nitrogen into a form usable by plants. When the plants die, ammonia is produced as a result of their decay. This ammonia is used by soil bacteria to produce nitrite, which in turn is then transformed to nitrate by another group of bacteria. In a natural setting, a delicate balance is maintained such that no excess nitrate is available to be leached beyond the root zone. Agricultural practices encourage plant growth through the addition of commercial fertilizers containing nitrogen compounds, usually in the form of nitrate. If fertilizer is applied in excess of

plant needs, the excess can be leached to groundwater. Other sources of nitrogen compounds which can be leached to groundwater include animal waste, septic systems, and wastewater discharges. In 2009, all occurrences of nitrate above the MCL occurred in the Coyote and Llagas Subbasins. Nitrate results are summarized by subbasin and aquifer zone in Table 3-11.

As elevated nitrate concentrations have been an ongoing groundwater quality challenge, the District has undertaken numerous efforts to define the extent and severity of nitrate contamination, identify potential sources, reduce nitrate loading, and reduce customer exposure to nitrate. These efforts have included establishing a nitrate monitoring network, performing free nitrate sampling for nearly 600 wells since 1998, implementing on-site nutrient assistance programs to growers between 2002 and 2007, and outreach regarding nitrate. The District is currently updating the Nitrate Management Plan and nitrate will also be addressed in the Salt and Nutrient Management Plan, which is required to be completed by 2014.

3.2.4 Radioactive Constituents

Radioactivity is the release of energy or energetic particles resulting from the rearrangement of the structure of the nucleus of certain atoms. The decay of the isotopes of uranium and thorium present in natural deposits results in most of the radioactivity in groundwater. Each step in the decay series results in the release of alpha or beta particles, or radiation. Radium-226 and Radium-228 are radioactive isotopes formed during the uranium-thorium decay series. These isotopes and emitted particles are hazardous to human health as they can damage cell structure. Radioactivity is commonly measured in units of “activity” rather than concentration. The unit of activity is picocuries per liter (pCi/L) and is roughly equivalent to two atoms decaying per minute. For certain types of ionizing radiation, the traditional unit of measurement is the radiation dose equivalent called roentgen equivalent in mammals, or rems per year.

Activity of gross alpha radiation was below the health-based threshold in all wells tested for this constituent in all subbasin categories. Activity counts ranged from a low of 0.71 pCi/L to a high of 7.1 pCi/L. The median count of alpha radiation is reported as < 3 pCi/L. Gross beta, radium-226, and radium-228 activities were below their respective MCLs in all wells tested for these constituents. The constituents in this group are listed and summarized in Table 3-12 along with comparison thresholds.

3.3 Agricultural Water Quality

In addition to comparing concentrations of constituents to drinking water standards, concentrations of select constituents are also compared to standards for agricultural use (irrigation, farming, etc) established by the Regional Water Quality Control Boards. This is accomplished by comparing select constituents to the agricultural threshold values found in Table 3-6 of the SFRWQCB Basin Plan and Tables 3-3 and 3-4 of the CCRWQCB Basin Plan, updated January 18, 2007, and August 5, 2006, respectively. The Santa Clara Subbasin and Coyote Subbasin fall under the jurisdiction of the SFWQCB and the Llagas Subbasin is under the jurisdiction of the CCRWQCB. Since each region has slightly different threshold values, they will be discussed separately.

The constituents with agricultural objectives and comparison thresholds for the San Francisco Bay and Central Coast regions are listed below in Table 3-5.

Table 3-5. Agricultural Related Constituents and Basin Plan Objectives

Constituent	Units	San Francisco Bay Region[1]	Central Coast Region[2]
Aluminum	µg/l	5000	5000
Arsenic	µg/l	100	100
Beryllium	µg/l	100	100
Boron	µg/l	500	750
Cadmium	µg/l	10	10
Chloride	mg/l	142	142[3]
Chromium	µg/l	100	100
Cobalt	µg/l	50	50
Copper	µg/l	200	200
Specific Conductance	µS/cm	--	750[4]
Fluoride	µg/l	1000	1000
Iron	µg/l	5000	5000
Lead	µg/l	5000	5000
Lithium	µg/l	--	2500
Manganese	µg/l	200	200
Mercury	µg/l	--	--
Molybdenum	µg/l	10	10
Nickel	µg/l	200	200
Nitrate + Nitrite as N	mg/l	5	--
Selenium	µg/l	--	20
Vanadium	µg/L	100	100
Zinc	µg/l	2000	2000
pH	––	5.5 – 8.3	--

Notes:
1. Agricultural objectives shown are threshold values from the San Francisco Regional Water Quality Control Board Basin Plan (Table 3-6).
2. Agricultural objectives shown are based on the maximum concentration for irrigation supply per Central Coast Regional Water Quality Control Board Basin Plan Table 3-4 (Water Quality Objectives for Agricultural Water Use), except as noted.
3. Chloride concentration represents the low end of the range for "increasing problems" for toxicity from root absorption from Central Coast Basin Plan Table 3-3 (Guidelines for Interpretation of Quality of Water for Irrigation).
4. Specific conductance concentration represents the low end of the range for "increasing problems" for salinity from Central Coast Basin Plan Table 3-3 (Guidelines for Interpretation of Quality of Water for Irrigation).

San Francisco Bay Region (Santa Clara and Coyote Subbasins)

In general, groundwater quality throughout the San Francisco Bay region meets the agricultural objectives set by the Regional Board with a few exceptions. The primary constituents detected above agricultural objectives are boron, chloride, iron, manganese, and nitrate. Most of the wells with constituents other than nitrate detected above objectives are shallow monitoring wells located in the region affected by saltwater intrusion. However, there is little to no agricultural use within this area, or the Santa Clara Subbasin in general. Most of the impacts above

agricultural objectives in the principal aquifer zone are due to nitrate + nitrite. Manganese was detected above the agricultural objective in one well in the Coyote Subbasin.

Central Coast Region (Llagas Subbasin)

In general, groundwater quality throughout the Llagas Subbasin meets the agricultural objectives set by the Regional Board with a few exceptions. The primary constituents detected above agricultural objectives are chloride, manganese, and specific conductance. According to Table 3-3 of the Central Coast Basin Plan, the objective for specific conductance of 750 µS/cm is at the lower end of the range for increasing problems and severe problems do not develop until 3,000 µS/cm is reached. All the wells having specific conductance greater than the value used for this analysis (lowest limit) are far below the level in which severe problems would be expected to occur. District staff will continue to monitor potential water quality changes that may impact agricultural use.

A summary table of wells having concentrations of constituents greater than established agricultural objectives is presented below in Table 3-6

Table 3-6. Summary of Constituents Detected above Agricultural Objectives

Constituent	Number of wells analyzed	Number of wells greater than objective
SANTA CLARA SUBBASIN – Shallow Aquifer Zone		
Boron	23	6
Chloride	23	4
Iron	23	1
Manganese	23	11
SANTA CLARA SUBBASIN – Principal Aquifer Zone		
Boron	21	2
Chloride	73	2
Copper	73	1
Iron	101	1
Manganese	91	2
Nitrate + Nitrite as N	54	9
COYOTE SUBBASIN		
Manganese	6	1
LLAGAS SUBBASIN– Shallow Aquifer Zone		
Chloride	11	1
Manganese	11	1
Specific Conductance	11	7
LLAGAS SUBBASIN – Principal Aquifer Zone		
Chloride	38	2
Manganese	38	2
Specific Conductance	60	13

Table 3-7. Summary of 2009 Water Quality Indicator Data

Constituent	Units	Santa Clara Subbasin								Coyote Subbasin				Llagas Subbasin								Maximum Contaminant Levels	
		Shallow Zone				Principal Zone								Shallow Zone				Principal Zone					
		Number of results[1]	Min	Median	Max	Number of results	Min	Median	Max	Number of results	Min	Median	Max	Number of results	Min	Median	Max	Number of results	Min	Median	Max	MCL[2]	SMCL[3]
Alkalinity	mg/l	23	143	343	669	73	128	220	376	6	162	190.5	339	11	88	248	381	38	<5	189.5	400	--	--
Color	Color Units	0	--	--	--	52	<1	<3	<5	0	--	--	--	0	--	--	--	7	<1	<1	5	--	15
Foaming Agents (MBAS)	mg/l	0	--	--	--	52	<0.05	<0.05	0.21	0	--	--	--	0	--	--	--	7	<0.5	<0.5	<0.5	--	0.5
Hardness as $CaCO_3$	mg/l	23	163	504	8050	73	57	272	500	6	189	256.5	295	11	126	363	531	39	11	270	515	--	--
Odor Threshold @ 60 C	TON	0	--	--	--	52	<1	<1	2	0	--	--	--	0	--	--	--	7	<1	<1	<1	--	3
pH	pH Units	23	6.7	7.6	8	71	6.5	7.8	8.3	6	7.2	7.4	7.8	11	6.9	7.1	7.6	38	7	7.55	9.9	--	6.5 – 8.5
Specific Conductance	µS/cm	23	466	1120	55400	102	7.2	630	2640	9	446	624	1040	11	325	787	1250	164	327	540	2630	--	900 (1600)
Turbidity	NTU	23	0.1	0.12	82	79	<0.1	0.19	48	6	0	0	1.1	11	0	0	8.7	41	<0.1	0.22	5.6	--	5

Notes: mg/l = milligrams per liter; µS/cm = microSiemens per centimeter; NTU = Nephelometric Turbidity Units; TON = Threshold Odor Number; min = minimum; Max = maximum;
Shallow Zone is represented by wells with total depth less than 150 feet. Principal Zone is represented by wells with total depth greater than 150 feet.

1. Number of results in 2009 for each parameter. Some parameters may have been analyzed more than once at a particular well.
2. MCL = Maximum Contaminant Level specified in Title 22 of the California Code of Regulations. The MCL is a health-based drinking water standard.
3. SMCL = Secondary Maximum Contaminant Level, or aesthetic-based standard, per California Department of Public Health or US EPA. For SMCLs having a range, the lower threshold is listed first with the upper threshold in parentheses.

Table 3-8. Summary of 2009 Volatile Organic Compound (VOC) Data

Constituent	Units	Santa Clara Subbasin						Coyote Subbasin			Llagas Subbasin						Maximum Contaminant Levels	
		Shallow Zone			Principal Zone						Shallow Zone			Principal Zone				
		Number of results[1]	Result[2]	RL[3]	Number of results	Result	RL	Number of results	Result	RL	Number of results	Result	RL	Number of results	Result	RL	MCL[4]	SMCL[5]
1,1,1,2-Tetrachlorethane	µg/l	17	ND	0.5	86	ND	0.5	8	ND	0.5	11	ND	0.5	57	ND	0.5	--	--
1,1,1-Trichloroethane	µg/l	17	D[1]	0.5	126	D	0.5	8	ND	0.5	11	ND	0.5	57	ND	0.5	200	--
1,1,2,2-Tetrachloroethane	µg/l	17	ND	0.5	126	ND	0.5	8	ND	0.5	11	ND	0.5	57	ND	0.5	1	--
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	µg/l	17	ND	0.5	126	D	10	6	D	0.5	11	ND	0.5	29	D	0.5	1200	--
1,1,2-Trichloroethane	µg/l	17	ND	0.5	126	ND	0.5	8	ND	0.5	11	ND	0.5	57	ND	0.5	5	--
1,1-Dichloroethane	µg/l	17	ND	0.5	126	ND	0.5	8	ND	0.5	11	ND	0.5	57	ND	0.5	5	--
1,1-Dichloroethylene	µg/l	17	ND	0.5	124	D	0.5	8	ND	0.5	11	ND	0.5	57	ND	0.5	6	--
1,1-Dichloropropene	µg/l	17	ND	0.5	87	ND	0.5	8	ND	0.5	11	ND	0.5	57	ND	0.5	--	--
1,2,3-Trichlorobenzene	µg/l	17	ND	0.5	87	ND	0.5	8	ND	0.5	11	ND	0.5	57	ND	0.5	--	--
1,2,3-Trichloropropane	µg/l	0	NA	--	39	ND	1	0	NA	--	0	NA	--	28	ND	0.5	--	--
1,2,4-Trichlorobenzene	µg/l	17	ND	0.5	126	ND	0.5	8	ND	0.5	11	ND	0.5	57	ND	0.5	5	--
1,2,4-Trimethylbenzene	µg/l	17	ND	0.5	87	ND	0.5	8	ND	0.5	11	ND	0.5	57	ND	0.5	--	--
1,2-Dichlorobenzene	µg/l	17	ND	0.5	126	ND	0.5	8	ND	0.5	11	ND	0.5	57	ND	0.5	600	--
1,2-Dichloroethane	µg/l	17	ND	0.5	126	ND	0.5	8	ND	0.5	11	ND	0.5	57	ND	0.5	0.5	--
1,2-Dichloropropane	µg/l	17	ND	0.5	126	ND	0.5	8	ND	0.5	11	ND	0.5	57	ND	0.5	5	--
1,3,5-Trimethylbenzene	µg/l	17	ND	0.5	87	ND	0.5	8	ND	0.5	11	ND	0.5	57	ND	0.5	--	--
1,3-Dichlorobenzene	µg/l	17	ND	0.5	87	ND	0.5	8	ND	0.5	11	ND	0.5	57	ND	0.5	--	--
1,3-Dichloropropane	µg/l	17	ND	0.5	87	ND	0.5	8	ND	0.5	11	ND	0.5	57	ND	0.5	--	--
1,3-Dichloropropene (Total)	µg/l	17	ND	0.5	126	ND	1	8	ND	0.5	11	ND	0.5	57	ND	0.5	0.5	--
1,3-Dinitrobenzene	µg/l	0	NA	--	11	ND	0.8	0	NA	--	0	NA	--		NA		--	--
1,4-Dichlorobenzene	µg/l	17	ND	0.5	126	ND	0.5	8	ND	0.5	11	ND	0.5	57	ND	0.5	5	--
1-Phenylpropane (n-propylbenzene)	µg/l	17	ND	0.5	86	ND	0.5	8	ND	0.5	11	ND	0.5	57	ND	0.5	--	--
2,2,4,4,5,5-Hexabromobiphenyl (HBB)	µg/l	0	NA	--	11	ND	0.7	0	NA	--	0	NA	--	0	NA	--	--	--
2,2,4,4,5,5-Hexabromodiphenyl Ether	µg/l	0	NA	--	11	ND	0.8	0	NA	--	0	NA	--	0	NA	--	--	--
2,2,4,4,5-Pentabromodiphenyl Ether	µg/l	0	NA	--	11	ND	0.9	0	NA	--	0	NA	--	0	NA	--	--	--
2,2,4,4,6-Pentabromodiphenyl Ether	µg/l	0	NA	--	11	ND	0.5	0	NA	--	0	NA	--	0	NA	--	--	--
2,2,4,4-Tetrabromodiphenyl Ether	µg/l	0	NA	--	11	ND	0.3	0	NA	--	0	NA	--	0	NA	--	--	--
2,2-Dichloropropane	µg/l	17	ND	0.5	59	ND	2	8	ND	0.5	11	ND	0.5	57	ND	0.5	--	--
2,4,6-Trinitrotoluene (TNT)	µg/l	0	NA	--	11	ND	0.8	0	NA	--	0	NA	--	0	NA	--	--	--
2,4-Dinitrotoluene	µg/l	0	NA	--	20	ND	0.1	4	ND	0.1	0	NA	--	0	NA	--	--	--

Table 3-8. Summary of 2009 VOC Data (continued)

Constituent	Units	Santa Clara Subbasin						Coyote Subbasin			Llagas Subbasin						Maximum Contaminant Levels	
		Shallow Zone			Principal Zone						Shallow Zone			Principal Zone				
		Number of results	Result	RL	Number of results	Result	RL	Number of results	Result	RL	Number of results	Result	RL	Number of results	Result	RL	MCL	SMCL
2,6-Dinitrotoluene	µg/l	0	NA	--	11	ND	0.1	0	NA	--	0	NA	--	0	NA	--	--	--
2-Chloroethylvinyl Ether	µg/l	0	NA	--	2	ND	10	0	NA	--	0	NA	--	0	NA	--	--	--
2-Chlorotoluene	µg/l	17	ND	0.5	87	ND	0.5	8	ND	0.5	11	ND	0.5	57	ND	0.5	--	--
4-Chlorotoluene	µg/l	17	ND	0.5	87	ND	0.5	8	ND	0.5	11	ND	0.5	57	ND	0.5	--	--
Acenaphthylene	µg/l	0	NA	--	1	ND	5	0	NA	--	0	NA	--	0	NA	--	--	--
Acetone	µg/l	0	NA	--	2	D	10	0	NA	--	0	NA	--	28	ND	10	--	--
Benzene	µg/l	17	ND	0.5	126	ND	0.5	8	ND	0.5	11	ND	0.5	57	ND	0.5	1	--
Benzo (a) Anthracene	µg/l	0	NA	--	1	ND	10	0	NA	--	0	NA	--	0	NA	--	--	--
Benzo (a) Pyrene	µg/l	0	NA	--	30	ND	0.1	4	ND	0.1	0	NA	--	1	NA	0.1	0.2	--
Benzo (b) Fluoranthene	µg/l	0	NA	--	1	ND	10	0	NA	--	0	NA	--	0	NA	--	--	--
Benzo (ghi) perylene	µg/l	0	NA	--	1	ND	10	0	NA	--	0	NA	--	0	NA	--	--	--
Benzo (k) fluoranthene	µg/l	0	NA	----	1	ND	10	0	NA	--	0	NA	--	0	NA	--	--	--
Benzyl Butyl Phthalate	µg/l	0	NA	--	1	ND	10	0	NA	--	0	NA	--	0	NA	--	--	--
Bromobenzene	µg/l	17	ND	0.5	87	ND	0.5	8	ND	0.5	11	ND	0.5	57	ND	0.5	--	--
Bromochloromethane	µg/l	17	ND	0.5	86	ND	0.5	8	ND	0.5	11	ND	0.5	57	ND	0.5	--	--
Bromodichloromethane (THM)	µg/l	17	ND	0.5	86	D	1	8	ND	1	11	ND	0.5	57	ND	0.5	--	--
Bromoform (THM)	µg/l	17	ND	0.5	87	D	1	8	ND	1	11	ND	0.5	57	ND	0.5	--	--
Bromomethane	µg/l	17	ND	0.5	58	ND	1	8	ND	0.5	11	ND	0.5	57	ND	0.5	--	--
Caffeine	µg/l	0	NA	--	0	NA	--	0	NA	--	0	NA	--	0	NA	--	--	--
Carbon Disulfide	µg/l	0	NA	--	1	ND	0.5	0	NA	--	0	NA	--	0	NA	--	--	--
Carbon Tetrachloride	µg/l	17	ND	0.5	126	ND	0.5	8	ND	0.5	11	ND	0.5	57	ND	0.5	0.5	--
Chlorodibromomethane	µg/l	0	NA	--	1	ND	1	0	NA	--	0	NA	--	0	NA	--	--	--
Chloroethane	µg/l	17	ND	0.5	58	ND	0.5	8	ND	0.5	11	ND	0.5	57	ND	0.5	--	--
Chloroform (THM)	µg/l	17	ND	0.5	87	D	1	8	ND	1	11	ND	0.5	57	D	0.5	--	--
Chloromethane	µg/l	17	ND	0.5	58	D	0.5	8	ND	0.5	11	ND	0.5	57	ND	0.5	--	--
Chrysene	µg/l	0	NA	--	1	ND	5	0	NA	--	0	NA	--	0	NA	--	--	--
cis-1,2-Dichloroethylene	µg/l	17	ND	0.5	125	ND	0.5	8	ND	0.5	11	ND	0.5	57	ND	0.5	6	--
di(2-ethylhexyl)Adipate	µg/l	0	NA	--	30	ND	5	4	ND	5	0	NA	--	1	NA	5	400	--
di(2-ethylhexyl)Phthalate	µg/l	0	NA	--	30	ND	3	4	ND	3	0	NA	--	1	NA	3	4	--
Dibenzo (a-h) Antracene	µg/l	0	NA	--	1	ND	5	0	NA	--	0	NA	--	0	NA	--	--	--
Dibromoacetic Acid	µg/l	0	NA	--	8	ND	1	0	NA	--	0	NA	--	0	NA	--	--	--
Dibromochloromethane (THM)	µg/l	17	ND	0.5	86	D	1	8	ND	1	11	ND	0.5	57	ND	0.5	--	--

Table 3-8. Summary of 2009 VOC Data (continued)

Constituent	Units	Santa Clara Subbasin						Coyote Subbasin			Llagas Subbasin						Maximum Contaminant Levels	
		Shallow Zone			Principal Zone						Shallow Zone			Principal Zone				
		Number of results	Result	RL	Number of results	Result	RL	Number of results	Result	RL	Number of results	Result	RL	Number of results	Result	RL	MCL	SMCL
Dibromochloropropane (DBCP)	µg/l	0	NA	--	37	ND	1	4	ND	0.01	0	NA	--	0	NA	--	0.2	--
Dibromomethane	µg/l	17	ND	0.5	87	ND	0.5	8	ND	0.5	11	ND	0.5	57	ND	0.5	--	--
Dichloroacetic	µg/l	0	NA	--	8	ND	1	0	NA	--	0	NA	--	0	NA	--	--	--
Dichlorobromomethane	µg/l	0	NA	--	1	ND	1	0	NA	--	0	NA	--	0	NA	--	--	--
Dichlorodifluoromethane (Freon 12)	µg/l	17	ND	0.5	86	ND	0.5	8	ND	0.5	11	ND	0.5	57	ND	0.5	--	--
Dichloromethane	µg/l	17	ND	0.5	126	ND	1	8	ND	0.5	11	ND	0.5	57	ND	0.5	5	--
Diethyl Phthalate	µg/l	0	NA	--	1	ND	5	0	NA	--	0	NA	--	0	NA	--	--	--
Diisopropyl Ether	µg/l	17	ND	0.5	48	ND	3	8	ND	3	11	ND	0.5	29	ND	0.5	--	--
Di-n-Butylphthalate	µg/l	0	NA	--	1	ND	5	0	NA	--	0	NA	--	0	NA	--	--	--
Ethylbenzene	µg/l	17	ND	0.5	126	ND	0.5	8	ND	0.5	11	ND	0.5	57	ND	0.5	300	--
Ethylene Dibromide (EDB)	µg/l	0	NA	--	29	ND	0.02	4	ND	0.02	0	NA	--	0	NA	--	0.05	--
Ethyl-Tert-Butyl Ether	µg/l	17	ND	0.5	57	ND	3	8	ND	3	11	ND	0.5	57	ND	3	--	--
Fluorene	µg/l	0	NA	--	1	ND	5	0	NA	--	0	NA	--	0	NA	--	--	--
Haloacetic Acids (HAA5)	µg/l	0	NA	--	8	ND	2	0	NA	--	0	NA	--	0	NA	--	60	--
Hexachlorobutadiene	µg/l	17	ND	0.5	87	ND	0.5	8	ND	0.5	11	ND	0.5	57	ND	0.5	--	--
Hexachloroethane	µg/l	0	NA	--	1	ND	1	0	NA	--	0	NA	--	0	NA	--	--	--
Indeno (1-2-3-CD) Pyrene	µg/l	0	NA	--	1	ND	10	0	NA	--	0	NA	--	0	NA	--	--	--
Isopropylbenzene	µg/l	17	ND	0.5	86	ND	0.5	8	ND	0.5	11	ND	0.5	57	ND	0.5	--	--
Methyl Ethyl Ketone (MEK- Butanone)	µg/l	0	NA	--	57	ND	10	2	ND	5	0	NA	--	28	ND	10	--	--
Methyl Isobutyl Ketone	µg/l	0	NA	--	59	ND	10	2	ND	5	0	NA	--	28	ND	10	--	--
Methyl-Tert-Butyl-Ether (MTBE)	µg/l	17	ND	3	129	ND	3	8	ND	3	11	ND	3	57	ND	3	5	5
Monobromoacetic Acid (MBAA)	µg/l	0	NA	--	8	ND	1	0	NA	--	0	NA	--	0	NA	--	--	--
Monochloroacetic Acid (MCAA)	µg/l	0	NA	--	8	ND	2	0	NA	--	0	NA	--	0	NA	--	--	--
Monochlorobenzene	µg/l	17	ND	0.5	126	ND	0.5	8	ND	0.5	11	ND	0.5	57	ND	0.5	70	--
m-p-Xylene	µg/l	17	ND	0.5	88	ND	0.5	8	ND	0.5	11	ND	0.5	57	ND	0.5	--	--
Naphthalene	µg/l	17	ND	0.5	92	ND	1	8	ND	0.5	11	ND	0.5	57	ND	1	--	--
n-Butylbenzene	µg/l	17	ND	0.5	87	ND	0.5	8	ND	0.5	11	ND	0.5	57	ND	0.5	--	--
o-Xylene	µg/l	17	ND	0.5	88	ND	0.5	8	ND	0.5	11	ND	0.5	57	ND	0.5	--	--
PCB-1016	µg/l	0	NA	--	22	ND	0.5	4	ND	0.5	0	NA	--	0	NA	--	0.5	--
PCB-1221	µg/l	0	NA	--	22	ND	0.5	4	ND	0.5	0	NA	--	0	NA	--	0.5	--
PCB-1232	µg/l	0	NA	--	22	ND	0.5	4	ND	0.5	0	NA	--	0	NA	--	0.5	--
PCB-1242	µg/l	0	NA	--	22	ND	0.5	4	ND	0.5	0	NA	--	0	NA	--	0.5	--
PCB-1248	µg/l	0	NA	--	22	ND	0.5	4	ND	0.5	0	NA	--	0	NA	--	0.5	--
PCB-1254	µg/l	0	NA	--	22	ND	0.5	4	ND	0.5	0	NA	--	0	NA	--	0.5	--
PCB-1260	µg/l	0	NA	--	22	ND	0.5	4	ND	0.5	0	NA	--	0	NA	--	--	--

Table 3-8. Summary of 2009 VOC Data (continued)

Constituent	Units	Santa Clara Subbasin						Coyote Subbasin			Llagas Subbasin						Maximum Contaminant Levels	
		Shallow Zone			Principal Zone						Shallow Zone			Principal Zone				
		Number of results	Result	RL	Number of results	Result	RL	Number of results	Result	RL	Number of results	Result	RL	Number of results	Result	RL	MCL	SMCL
Phenanthrene	µg/l	0	NA	--	1	ND	5	0	NA	--	0	NA	--	0	NA	--	--	--
p-Isopropyltoluene	µg/l	17	ND	0.5	86	ND	0.5	8	ND	0.5	11	ND	0.5	57	ND	0.5	--	--
Polychlorinated Biphenyls (total PCBs)	µg/l	0	NA	--	10	ND	0.5	0	NA	--	0	NA	--	1	NA	0.5	0.5	--
Pyrene	µg/l	0	NA	--	1	ND	5	0	NA	--	0	NA	--	0	NA	--	--	--
RDX (Hexahydro-1,3,5-Trinitro-1,3,5-Triazine)	µg/l	0	NA	--	11	ND	1	0	NA	--	0	NA	--	0	NA	--	--	--
sec-Butylbenzene	µg/l	17	ND	0.5	87	ND	0.5	8	ND	0.5	11	ND	0.5	57	ND	0.5	--	--
Styrene	µg/l	17	ND	0.5	126	ND	0.5	8	ND	0.5	11	ND	0.5	57	ND	0.5	100	--
Tert-Amyl-Methyl Ether	µg/l	17	ND	0.5	57	ND	3	8	ND	3	11	ND	0.5	57	ND	3	--	--
Tert-Butyl Alcohol	µg/l	17	ND	0.5	29	ND	10	6	ND	0.5	11	ND	0.5	29	ND	0.5	--	--
tert-Butylbenzene	µg/l	17	ND	0.5	87	ND	0.5	8	ND	0.5	11	ND	0.5	57	ND	0.5	--	--
Tetrachloroethylene	µg/l	17	ND	0.5	126	ND	0.5	8	ND	0.5	11	ND	0.5	57	D	0.5	5	--
Toluene	µg/l	17	ND	0.5	126	ND	0.5	8	ND	0.5	11	ND	0.5	57	ND	0.5	150	--
Total Trihalomethanes	µg/l	0	NA	--	38	D	4	2	ND	0.5	0	NA	--	0	NA	--	80	--
trans-1-2-Dichloroethylene	µg/l	17	ND	0.5	126	ND	0.5	8	ND	0.5	11	ND	0.5	57	ND	0.5	10	--
Trichloroacetic acid	µg/l	0	NA	--	8	ND	1	0	NA	--	0	NA	--	0	NA	--	--	--
Trichloroethylene	µg/l	17	D	0.5	126	ND	0.5	8	ND	0.5	11	ND	0.5	57	ND	0.5	5	--
Trichlorofluoromethane (Freon 11)	µg/l	17	ND	0.5	126	ND	5	8	ND	5	11	ND	0.5	57	ND	5	150	--
Vinyl Chloride	µg/l	17	ND	0.5	126	ND	0.5	8	ND	0.5	11	ND	0.5	57	ND	0.5	0.5	--
Xylenes (Total)	µg/l	17	ND	0.5	126	ND	1	8	ND	1	11	ND	0.5	57	ND	0.5	1750	--

Notes: µg/l = micrograms per liter; Shallow Zone is represented by wells with total depth less than 150 feet. Principal Zone is represented by wells with total depth greater than 150 feet.
1. Number of results in 2009 for each parameter. Some parameters may have been analyzed more than once at a particular well.
2. ND= not detected above laboratory reporting limit. NA = not analyzed. D = detection above reporting limit.
3. RL = Laboratory reporting limit. In the case of multiple reporting limits, the highest limit is shown.
4. MCL = Maximum Contaminant Level specified in Title 22 of the California Code of Regulations. The MCL is a health-based drinking water standard.
5. SMCL = Secondary Maximum Contaminant Level, or aesthetic-based standard, per California Department of Public Health or US EPA. For SMCLs having a range, the lower threshold is listed first with the upper threshold in parentheses.

Table 3-9. Summary of Detected Volatile Organic Compounds (VOCs)

Constituent	Units	Santa Clara Subbasin								Coyote Subbasin				Llagas Subbasin								Maximum Contaminant Levels	
		Shallow Zone				Principal Zone								Shallow Zone				Principal Zone					
		Number of results[1]	Min	Median	Max	Number of results	Min	Median	Max	Number of results	Min	Median	Max	Number of results	Min	Median	Max	Number of results	Min	Median	Max	MCL[2]	SMCL[3]
1,1,1-Trichloroethane	µg/l	17	<0.5	<0.5	0.7	126	<0.5	<0.5	3.9	8	<0.5	<0.5	<0.5	11	<0.5	<0.5	<0.5	57	<0.5	<0.5	<0.5	200	--
1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon 113)	µg/l	17	<0.5	<0.5	<0.5	126	<10	<10	14	6	<0.5	<0.5	2.1	11	<0.5	<0.5	<0.5	29	<0.5	<0.5	3.8	1200	--
1,1-Dichloroethylene	µg/l	17	<0.5	<0.5	<0.5	124	<0.5	<0.5	3.4	8	<0.5	<0.5	<0.5	11	<0.5	<0.5	<0.5	57	<0.5	<0.5	<0.5	6	--
Acetone	µg/l	0	--	--	--	1	5	5	5	0	--	--	--	0	--	--	--	28	<10	<10	<10	--	--
Bromodichloromethane (THM)	µg/l	17	<0.5	<0.5	<0.5	59	<0.5	<0.5	0.51	8	<0.5	<0.5	<1	11	<0.5	<0.5	<0.5	57	<0.5	<0.5	<0.5	--	--
Bromoform (THM)	µg/l	17	<0.5	<0.5	<0.5	87	<1	<1	9.8	8	<0.5	<0.5	<1	11	<0.5	<0.5	<0.5	57	<0.5	<0.5	2	--	--
Chloroform (THM)	µg/l	17	<0.5	<0.5	<0.5	59	<0.5	<0.5	0.51	8	<0.5	<0.5	<1	11	<0.5	<0.5	<0.5	57	<0.5	<0.5	16.1	--	--
Chloromethane	µg/l	17	<0.5	<0.5	<0.5	58	<0.5	<0.5	0.51	8	<0.5	<0.5	<0.5	11	<0.5	<0.5	<0.5	57	<0.5	<0.5	<0.5	--	--
Dibromochloromethane (THM)	µg/l	17	<0.5	<0.5	<0.5	86	<1	<1	1.6	8	<0.5	<0.5	<1	11	<0.5	<0.5	<0.5	57	<0.5	<0.5	<0.5	--	--
Tetrachloroethylene	µg/l	17	<0.5	<0.5	<0.5	126	<0.5	<0.5	<0.5	8	<0.5	<0.5	<0.5	11	<0.5	<0.5	<0.5	57	<0.5	<0.5	2.8	5	--
Total Trihalomethanes	µg/l	0	--	--	--	38	<4	<4	12	2	<0.5	<0.5	<0.5	0	--	--	--	0	--	--	--	80	--
Trichloroethylene	µg/l	17	<0.5	<0.5	0.9	126	<0.5	<0.5	<0.5	8	<0.5	<0.5	<0.5	11	<0.5	<0.5	<0.5	57	<0.5	<0.5	<0.5	5	--

Notes: µg/l = micrograms per liter; Min = minimum value; Max = maximum
Shallow Zone is represented by wells with total depth less than 150 feet. Principal Zone is represented by wells with total depth greater than 150 feet.
1. Number of results in 2009 for each parameter. Some parameters may have been analyzed more than once at a particular well.
2. MCL = Maximum Contaminant Level specified in Title 22 of the California Code of Regulations. The MCL is a health-based drinking water standard.
3. SMCL = Secondary Maximum Contaminant Level, or aesthetic-based standard, per California Department of Public Health or US EPA. For SMCLs having a range, the lower threshold is listed first with the upper threshold in parentheses.

Table 3-10. Summary of 2009 Pesticide Data

Constituent	Units	Santa Clara Subbasin						Coyote Subbasin			Llagas Subbasin						Maximum Contaminant Levels	
		Shallow Zone			Principal Zone						Shallow Zone			Principal Zone				
		Number of results[1]	Result[2]	RL[3]	Number of results	Result	RL	Number of results	Result	RL	Number of results	Result	RL	Number of results	Result	RL	MCL[4]	SMCL[5]
2,3,7,8-TCDD (Dioxin)	pg/l	0	NA	5.0	29	ND	5.0	3	ND	5.0	0	NA	5.0	1	ND	5.0	30	--
2,4,5-T	µg/l	0	NA	--	8	ND	1	0	NA	--	0	NA	--	0	NA	--	--	--
2,4,5-TP (Silvex)	µg/l	0	NA	--	32	ND	1	4	ND	1	0	NA	--	0	NA	--	50	--
2,4-D	µg/l	0	NA	--	32	ND	10	4	ND	10	0	NA	--	0	NA	--	70	--
3-Hydroxycarbofuran	µg/l	0	NA	--	29	ND	3	4	ND	3	0	NA	--	1	ND	3	--	--
4,4-DDE	µg/l	0	NA	--	11	ND	0.1	0	NA	--	0	NA	--	0	NA	--	--	--
Acetochlor	µg/l	0	NA	--	11	ND	0.1	0	NA	--	0	NA	--	0	NA	--	--	--
Aldrin	µg/l	0	NA	--	30	ND	1	4	ND	3	0	NA	--	1	ND	1	--	--
Alachlor	µg/l	0	NA	--	29	ND	3	4	ND	4	0	NA	--	1	ND	3	2	--
Aldicarb	µg/l	0	NA	--	29	ND	4	4	ND	3	0	NA	--	1	ND	4	--	--
Aldicarb Sulfone	µg/l	0	NA	--	29	ND	3	4	ND	0.075	0	NA	--	1	ND	3	--	--
Aldicarb Sulfoxide	µg/l	0	NA	--	29	ND	0.075	4	ND	1	0	NA	--	1	ND	0.075	--	--
Ametryn	µg/l	0	NA	--	1	ND	1	0	NA	--	0	NA	--	0	NA	--	--	--
Atrazine	µg/l	0	NA	--	30	ND	0.5	4	ND	0.5	0	NA	--	1	ND	0.5	1	--
Bentazon	µg/l	0	NA	--	32	ND	2	4	ND	2	0	NA	--	0	NA	--	18	--
Bromacil	µg/l	0	NA	--	28	ND	10	4	ND	10	0	NA	--	1	ND	10	--	--
Butachlor	µg/l	0	NA	--	29	ND	0.38	4	ND	0.38	0	NA	--	1	ND	0.38	--	--
Butylate	µg/l	0	NA	--	1	ND	1	0	NA	--	0	NA	--	0	NA	--	--	--
Carbaryl	µg/l	0	NA	--	29	ND	5	4	ND	5	0	NA	--	1	ND	5	--	--
Carbofuran	µg/l	0	NA	--	30	ND	5	4	ND	5	0	NA	--	1	ND	5	18	--
Chlordane	µg/l	0	NA	--	30	ND	0.1	4	ND	0.1	0	NA	--	1	ND	0.1	0.1	--
Chloroneb	µg/l	0	NA	--	1	ND	0.5	0	NA	--	0	NA	--	0	NA	--	--	--
Chloropropham	µg/l	0	NA	--	1	ND	0.5	0	NA	--	0	NA	--	0	NA	--	--	--
Chlorothalonil	µg/l	0	NA	--	8	ND	5	0	NA	--	0	NA	--	1	ND	5	--	--
Chlorpyrifos	µg/l	0	NA	--	1	ND	1	0	NA	--	0	NA	--	0	NA	--	--	--
cis-1,3-Dichloropropene	µg/l	17	ND	0.5	55	ND	0.5	8	ND	0.5	11	ND	0.5	29	ND	0.5	0.5	--
Cycloate	µg/l	0	NA	--	1	ND	0.3	0	NA	--	0	NA	--	0	NA	--	--	--
Dalapon	µg/l	0	NA	--	32	ND	10	4	ND	10	0	NA	--	0	NA	--	200	--
DCPA (total di & mono acid degradates)	µg/l	0	NA	--	22	ND	1	4	ND	0.1	0	NA	--	0	NA	--	--	--
Diazinon	µg/l	0	NA	--	28	ND	0.25	4	ND	0.1	0	NA	--	1	ND	0.25	--	--
Dicamba	µg/l	0	NA	--	32	ND	1.5	4	ND	1.5	0	NA	--	0	NA	--	--	--
Dieldrin	µg/l	0	NA	--	29	ND	0.02	4	ND	0.02	0	NA	--	1	ND	0.02	--	--
Dimethoate	µg/l	0	NA	--	39	ND	10	4	ND	0.1	0	NA	--	1	ND	10	--	--
Dimethyl Phthalate	µg/l	0	NA	--	1	ND	5	0	NA	--	0	NA	--	0	NA	--	--	--

Table 3-10. Summary of 2009 Pesticide Data (continued)

Constituent	Units	Santa Clara Subbasin						Coyote Subbasin			Llagas Subbasin						Maximum Contaminant Levels	
		Shallow Zone			Principal Zone						Shallow Zone			Principal Zone				
		Number of results	Result	RL	Number of results	Result	RL	Number of results	Result	RL	Number of results	Result	RL	Number of results	Result	RL	MCL	SMCL
Dinoseb	µg/l	0	NA	--	32	ND	2	4	ND	2	0	NA	--	0	NA	--	7	--
Diphenamide	µg/l	0	NA	--	1	ND	100	0	NA	--	0	NA	--	0	NA	--	--	--
Diquat	µg/l	0	NA	--	30	ND	4	4	ND	4	0	NA	--	1	ND	4	20	--
Diuron	µg/l	0	NA	--	5	ND	1	0	NA	--	0	NA	--	0	NA	--	--	--
Endothall	µg/l	0	NA	--	30	ND	45	4	ND	45	0	NA	--	1	ND	45	100	--
Endrin	µg/l	0	NA	--	30	ND	0.1	4	ND	0.1	0	NA	--	1	ND	0.1	2	--
EPTC	µg/l	0	NA	--	11	ND	0.1		ND	--	0	NA	--	0	NA	--	--	--
Gamma-BHC (Lindane)- total	µg/l	0	NA	--	30	ND	0.2	4	ND	0.2	0	NA	--	1	ND	0.2	0.2	--
Glyphosate	µg/l	0	NA	--	30	ND	25	4	ND	25	0	NA	--	1	ND	25	700	--
Heptachlor	µg/l	0	NA	--	30	ND	0.01	4	ND	0.01	0	NA	--	1	ND	0.01	0.01	--
Heptachlor Epoxide	µg/l	0	NA	--	30	ND	0.01	4	ND	0.01	0	NA	--	1	ND	0.01	0.01	--
Hexachlorobenzene	µg/l	0	NA	--	30	ND	0.5	4	ND	0.5	0	NA	--	1	ND	0.5	1	--
Hexachlorocyclopentadiene	µg/l	0	NA	--	30	ND	1	4	ND	1	0	NA	--	1	ND	1	50	--
Methiocarb	µg/l	0	NA	--	20	ND	0.5	4	ND	0.5	0	NA	--	0	NA	--	--	--
Methomyl	µg/l	0	NA	--	29	ND	2	4	ND	2	0	NA	--	1	ND	2	--	--
Methoxychlor	µg/l	0	NA	--	30	ND	10	4	ND	10	0	NA	--	1	ND	10	30	--
Metolachlor	µg/l	0	NA	--	29	ND	0.5	4	ND	0.05	0	NA	--	1	ND	0.5	--	--
Metribuzin	µg/l	0	NA	--	29	ND	1	4	ND	0.05	0	NA	--	1	ND	0.5	--	--
Molinate	µg/l	0	NA	--	30	ND	2	4	ND	2	0	NA	--	1	ND	2	20	--
Napropamide	µg/l	0	NA	--	1	ND	1	--	ND	--	0	NA	--	0	NA	--	--	--
Oxamyl	µg/l	0	NA	--	30	ND	20	4	ND	20	0	NA	--	1	ND	20	50	--
Paraquat	µg/l	0	NA	--	1	ND	20	--	ND	--	0	NA	--	0	NA	--	--	--
Pentachlorophenol	µg/l	0	NA	--	32	ND	0.2	4	ND	0.2	0	NA	--	0	NA	--	1	--
Permethrin	µg/l	0	NA	--	1	ND	2	--	ND	--	0	NA	--	0	NA	--	--	--
Picloram	µg/l	0	NA	--	32	ND	1	4	ND	1	0	NA	--	0	NA	--	500	--
Prometryn	µg/l	0	NA	--	1	ND	2	--	ND	--	0	NA	--	0	NA	--	--	--
Propachlor	µg/l	0	NA	--	29	ND	0.5	4	ND	0.5	0	NA	--	1	ND	0.5	--	--
Propazine	µg/l	0	NA	--	1	ND	0.5	--	ND	--	0	NA	--	0	NA	--	--	--
Propoxur	µg/l	0	NA	--	20	ND	0.5	4	ND	0.5	0	NA	--	0	NA	--	--	--
Simazine	µg/l	0	NA	--	30	ND	1	4	ND	1	0	NA	--	1	ND	1	4	--
Simetryn	µg/l	0	NA	--	1	ND	1	--	ND	--	0	NA	--	0	NA	--	--	--

Table 3-10. Summary of 2009 Pesticide Data (continued)

Constituent	Units	Santa Clara Subbasin						Coyote Subbasin			Llagas Subbasin						Maximum Contaminant Levels	
		Shallow Zone			Principal Zone						Shallow Zone			Principal Zone				
		Number of results	Result	RL	Number of results	Result	RL	Number of results	Result	RL	Number of results	Result	RL	Number of results	Result	RL	MCL	SMCL
Terbacil	µg/l	0	NA	--	11	ND	0.1	--	ND	--	0	NA	--	0	NA	--	--	--
Terbufos Sulfone	µg/l	0	NA	--	11	ND	0.4	--	ND	--	0	NA	--	0	NA	--	--	--
Terbutryn	µg/l	0	NA	--	1	ND	1	--	ND	--	0	NA	--	0	NA	--	--	--
Thiobencarb	µg/l	0	NA	--	30	ND	1	4	ND	1	0	NA	--	1	ND	1	70	1
Toxaphene	µg/l	0	NA	--	30	ND	1	4	ND	1	0	NA	--	1	ND	1	3	--
trans-1,3-Dichloropropene	µg/l	17	ND	0.5	55	ND	0.5	8	ND	0.5	11	ND	0.5	29	ND	0.5	--	--
Triadimefon	µg/l	0	NA	--	1	ND	0.5	--	ND	--	0	NA	--	0	NA	--	--	--
Trifluralin	µg/l	0	NA	--	9	ND	1	--	ND	--	0	NA	--	1	ND	1	--	--
Vernolate	µg/l	0	NA	--	1	ND	0.5	--	ND	--	0	NA	--	0	NA	--	--	--

Notes: µg/l = micrograms per liter; pg/l = picogram per liter
Shallow Zone is represented by wells with total depth less than 150 feet. Principal Zone is represented by wells with total depth greater than 150 feet.
1. Number of results in 2009 for each parameter. Some parameters may have been analyzed more than once at a particular well.
2. ND= not detected above laboratory reporting limit. NA = not analyzed.
3. RL = Laboratory reporting limit. In the case of multiple reporting limits, the highest limit is shown.
4. MCL = Maximum Contaminant Level specified in Title 22 of the California Code of Regulations. The MCL is a health-based drinking water standard.
5. SMCL = Secondary Maximum Contaminant Level, or aesthetic-based standard, per California Department of Public Health or US EPA. For SMCLs having a range, the lower threshold is listed first with the upper threshold in parentheses.

Table 3-11. Summary of 2009 Inorganic Constituent Data

Constituent	Units	Santa Clara Subbasin								Coyote Subbasin				Llagas Subbasin								Maximum Contaminant Levels	
		Shallow Zone				Principal Zone								Shallow Zone				Principal Zone					
		Number of results[1]	Min	Median	Max	Number of results	Min	Median	Max	Number of results	Min	Median	Max	Number of results	Min	Median	Max	Number of results	Min	Median	Max	MCL[2]	SMCL[3]
MAJOR AND MINOR IONS																							
Bicarbonate ion (as HCO3-)	mg/l	23	143	343	669	69	128	260	410	6	162	190.5	339	11	88	248	381	38	0	195	490	--	--
Bromide	mg/l	23	<0.05	0.2	2.94	21	<0.05	0.12	3.68	6	0.07	0.115	0.33	11	<0.05	0.15	0.39	31	<0.05	0.14	303	--	--
Calcium	mg/l	23	38.8	94.2	657	73	12.3	66	140	6	30	51.8	66.7	11	17.5	73	105	39	5.1	54	123	--	--
Chloride	mg/l	23	27	68	20600	73	<10	44	699	6	17	40	115	11	9	52	170	38	17	41.5	804	--	250 (500)
Cyanide	µg/l	0	--	--	--	56	<100	<100	<100	2	<5	<5	<5	0	--	--	--	7	<100	<100	<100	150	--
Fluoride	mg/l	23	<0.05	0.14	0.53	80	<0.1	0.13	0.41	6	0.079	0.145	0.16	11	0.063	0.12	0.18	38	<0.1	0.12	0.3	2	--
Magnesium	mg/l	23	12.3	49.4	1550	73	4.1	25	56	6	27.9	29.1	43.2	11	15.1	46.7	73.6	39	<0.5	30	68	--	--
Perchlorate	µg/l	23	<4	<4	<4	84	<4	<4	<4	9	<4	<4	<4	11	<4	<4	<4	56	<4	<4	6.5	6	--
Potassium	mg/l	23	0.9	1.5	43.4	73	<2	1.3	3	6	0.9	1.3	2.3	11	<0.5	0.9	1.7	38	<2	1.25	28.9	--	--
Silica	mg/l	23	19.5	23.4	43.1	21	17	25.2	46.7	21	17	25.2	46.7	11	18.4	27.6	34.2	31	1.7	27.9	58.6	--	--
Sodium	mg/l	23	19.4	57.7	11300	73	14	31.2	427	6	18.9	28.85	112	11	15	32.4	92.5	38	14	32.95	317	--	--
Sulfate	mg/l	23	33.5	101	2480	73	<0.5	38.3	116	6	19.9	38.4	52.6	11	22.6	57.2	128	47	0.7	34	96.9	--	250 (500)
Total Dissolved Solids	mg/l	23	284	744	35900	73	214	390	1410	6	308	330	560	11	194	470	780	38	198	369	1420	--	500 (1000)
NUTRIENTS																							
Nitrate (as NO_3)	mg/l	23	<0.05	2.7	31.2	291	<2	21	41	35	<0.05	22	62	11	0.218	51.5	187	189	<1	30	155	45	--
Nitrate + nitrite (as N)	mg/l	0	--	--	--	54	610	3550	8300	0	--	--	--	0	--	--	--	--	--	--	--	10	--
Nitrite (as N)	mg/l	0	--	--	--	60	<400	<400	<400	10	<400	<400	<400	0	--	--	--	13	<400	<400	<400	1	--
Phosphate	mg/l	23	<0.05	0.1	1.09	21	<0.05	0.24	2.81	6	<0.05	0.07	0.3	11	<0.05	<0.05	0.09	32	<0.05	0.05	0.64	--	--
TRACE ELEMENTS																							
Aluminum	µg/l	23	<20	<20	77	89	<50	<50	2900	6	<20	<20	29.1	11	<20	<20	97	38	<50	<50	260	1000	200
Antimony	µg/l	22	<2	<2	<2	79	<6	<6	<6	6	<2	<2	<2	11	<2	<2	<2	38	<6	<6	<6	6	--
Arsenic	µg/l	22	<2	<2	13	79	<2	<2	10	6	<2	<2	<2	11	<2	<2	<2	38	<2	<2	4	10	--
Barium	µg/l	38	<100	110	1100	79	<100	110	400	6	73.5	94.4	140	11	49.9	140	320	38	<100	110	1100	1000	--
Beryllium	µg/l	22	<1	<1	<1	22	<1	<1	<1	6	<1	<1	<1	11	<1	<1	<1	38	<1	<1	<1	4	--
Boron	µg/l	23	86.4	221	2080	21	58.1	158	3780	6	64.2	113	140	11	<50	134	318	31	<50	100	212	--	--
Cadmium	µg/l	22	<1	<1	<1	79	<1	<1	<1	6	<1	<1	<1	11	<1	<1	<1	38	<1	<1	<1	5	--
Chromium (total)	µg/l	22	<5	<5	8.7	74	<10	<10	44	6	<5	<5	<5	11	<5	<5	<5	38	<10	<10	<10	50	--
Copper	µg/l	22	<5	<5	<5	73	<50	<50	210	6	<5	5.2	6.9	11	<5	<5	6.9	38	<50	<50	55	1300	1000
Iron	µg/l	23	<20	<20	25000	101	<200	<200	6000	6	<20	<20	600	11	<20	<20	49	38	<100	<100	630	--	300
Lead	µg/l	22	<5	<5	<5	78	<5	<5	6	6	<5	<5	<5	11	<5	<5	<5	38	<5	<5	<5	15	--
Manganese	µg/l	23	<10	124	6540	91	<20	<20	439	6	<10	<10	343	11	<10	<10	406	38	<20	<20	288	--	50
Mercury	µg/l	23	<1	<1	<1	80	<1	<1	<1	6	<1	<1	<1	11	<1	<1	<1	38	<1	<1	<1	2	--
Nickel	µg/l	22	<5	<5	22	79	<10	<10	<10	0	--	--	--	11	<5	<5	13	38	<10	<10	<10	100	--

Table 3-11. Inorganic Constituents (continued)

Constituent	Units	Santa Clara Subbasin								Coyote Subbasin				Llagas Subbasin								Maximum Contaminant Levels	
		Shallow Zone				Principal Zone								Shallow Zone				Principal Zone					
		Number of results	Min	Median	Max	Number of results	Min	Median	Max	Number of results	Min	Median	Max	Number of results	Min	Median	Max	Number of results	Min	Median	Max	MCL	SMCL
Selenium	µg/l	22	<5	<5	8	79	<5	<5	48	6	<5	<5	<5	11	<5	<5	6	38	<5	<5	9	50	--
Silver	µg/l	22	<5	<5	<5	72	<10	<10	<10	6	<5	<5	<5	11	<5	<5	<5	38	<10	<10	<10	--	100
Thallium	µg/l	22	<1	<1	<1	79	<1	<1	<1	6	<1	<1	<1	11	<1	<1	<1	38	<1	<1	<1	2	--
Vanadium	µg/l	22	<3	<3	4.5	21	<3	<3	8.6	6	<3	<3	<3	11	<3	<3	3.8	31	<3	<3	15	--	--
Zinc	µg/l	23	<10	<10	430	73	<50	<50	100	6	<10	<10	140	11	<10	<10	200	38	<50	<50	330	--	5000

Notes: mg/l = milligrams per liter; µg/l = micrograms per liter; Min = minimum value; Max = maximum value
Shallow Zone is represented by wells with total depth less than 150 feet. Principal Zone is represented by wells with total depth greater than 150 feet.
1. Number of results in 2009 for each parameter. Some parameters may have been analyzed more than once at a particular well.
2. MCL = Maximum Contaminant Level specified in Title 22 of the California Code of Regulations. The MCL is a health-based drinking water standard. Lead and Copper Action Rule values shown for those constituents.
3. SMCL = Secondary Maximum Contaminant Level, or aesthetic-based standard, per California Department of Public Health or US EPA. For SMCLs having a range, the lower threshold is listed first with the upper threshold in parentheses.

Table 3-12. Summary of 2009 Radioactive Constituent Data

Constituent	Units	Santa Clara Subbasin								Coyote Subbasin				Llagas Subbasin								Maximum Contaminant Levels	
		Shallow Zone				Principal Zone								Shallow Zone				Principal Zone					
		Number of results[1]	Min	Median	Max	Number of results	Min	Median	Max	Number of results	Min	Median	Max	Number of results	Min	Median	Max	Number of results	Min	Median	Max	MCL[2]	SMCL[3]
Gross alpha radiation	pCi/l	0	--	--	--	25	<3	<3	7.1	10	<3	<3	<3	0	--	--	--	33	<3	<3	4.25	15	--
Gross beta radiation	mrem/yr	0	--	--	--	10	<4	<4	4	0	--	--	--	0	--	--	--	0	--	--	--	50	--
Radium 226	mrem/yr	0	--	--	--	2	<1	<1	<1	0	--	--	--	0	--	--	--	0	--	--	--	--	--
Radium 228	mrem/yr	0	--	--	--	7	<1	<1	1	0	--	--	--	0	--	--	--	1	<1	<1	<1	--	--

Notes: pCi/l = picocuries per liter; mrem/yr = millirem per year; Min = minimum value; Max = maximum value
Shallow Zone is represented by wells with total depth less than 150 feet. Principal Zone is represented by wells with total depth greater than 150 feet.
1. Number of results in 2009 for each parameter. Some parameters may have been analyzed more than once at a particular well.
2. MCL = Maximum Contaminant Level specified in Title 22 of the California Code of Regulations. The MCL is a health-based drinking water standard. Lead and Copper Action Rule values shown for those constituents.
3. SMCL = Secondary Maximum Contaminant Level, or aesthetic-based standard, per California Department of Public Health or US EPA. For SMCLs having a range, the lower threshold is listed first with the upper threshold in parentheses.

4.0 Evaluation of Trends for Nitrate, Chloride, and Total Dissolved Solids

The timely identification of adverse trends is an important goal of the District's monitoring program so that appropriate action can be taken to protect groundwater resources. The three constituents analyzed for trend are nitrate (as NO_3^-), chloride, and total dissolved solids (TDS). TDS was chosen for trend testing because it is an indicator of salt loading and of overall water quality, nitrate because it affects the largest number of wells in the County, and chloride because of historical saltwater intrusion.

For this trend evaluation, a trend period of 10 years is chosen beginning January 2000 and ending December 2009. Trend wells include approximately 100 wells monitored by the District and 213 wells sampled by water suppliers. The results of trend testing for wells representing each subbasin and each constituent are summarized in Table 4-1, below. The number of wells analyzed for trend for each constituent and each zone varies, and was based on the availability of results for each constituent. Well sites having fewer than four records of data for each selected constituent were not included in this evaluation. The following section briefly describes the trend analysis procedure used to evaluate trends.

4.1 Estimating Trends in Water Quality

To evaluate potential trends, the simple (non-seasonal) Mann-Kendall test procedure was computed using MAROS (Monitoring and Remediation Optimization System) software, developed by the Air Force Center for Environmental Excellence, in part, to assist users with groundwater data trend analysis. The simple (non-seasonal) Mann-Kendall test is a nonparametric test used to detect possible trends in water quality constituents over time at individual well sites. Standard hypothesis tests structure and a 95% confidence level were used to interpret test results. MAROS was not used for some nitrate (as NO_3^-) trend wells and one chloride trend well having censored observations (data reported as "non-detectable"). These were computed individually by re-censoring to the highest detection limit and making the appropriate adjustments for the presence of ties.

For sites having a statistically significant trend, the magnitude of the trend is also estimated. The magnitude is the trend slope or rate at which concentration is increasing or decreasing over time for a given well. For sites having significant upward and downward trends, results of the trend analysis along with the magnitude of trend are presented in Appendix B and C, respectively. The well sites with no detectable trend are presented in Appendix D. A description of the trend analysis procedure is presented in Appendix E.

4.3 Limitations

Although the minimum requirements of the test procedure were met with respect to sample size, the data may have some limitations. For instance, the testing procedure will identify a statistically significant trend even though the change in concentration may be very small. Secondly, an ideal trend evaluation would have data collected at consistent and evenly spaced intervals for all wells.

4.4 Trend Test Results

The Mann-Kendall test was used to test for trends in chloride, total dissolved solids, and nitrate in 177, 164, and 376 wells, respectively, across the three subbasins as shown in Figures 4-1 through 4-6. A summary of the Mann-Kendall test results by subbasin is presented in Table 4-1. Individual well sites having significant upward and downward trends are presented in Appendix B and C, respectively, along with the detailed results of the trend testing procedure.

Table 4-1. Summary of Mann-Kendall Trend Analysis Results, 2000 - 2009.

Constituent	Number of wells analyzed	Wells with upward trend	Range of up trend magnitude (mg/L/yr)	Wells with downward trend	Range of down trend magnitude (mg/L/yr)	Wells with no trend
SANTA CLARA SUBBASIN – Shallow Aquifer Zone						
Total dissolved solids	16	2	34 - 91	1	4.15	13
Chloride	24	2	0.87 - 40	10	1.2 – 134.8	12
Nitrate	16	1	0.79	0	--	15
SANTA CLARA SUBBASIN – Principal Aquifer Zone						
Total dissolved solids	93	2	9 – 9.6	2	10.6 – 15.5	89
Chloride	98	1	1.22	2	1.2 – 4.0	95
Nitrate	221	13	0.34 – 2.13	16	0.38 – 3.35	192
COYOTE SUBBASIN						
Total dissolved solids	10	1	19.8	0	--	9
Chloride	11	0	--	0	--	11
Nitrate	25	4	0.6 – 1.2	4	0.25 – 0.77	17
LLAGAS SUBBASIN – Shallow Aquifer Zone						
Total dissolved solids	14	0	--	0	--	14
Chloride	12	2	1.8 – 3.0	0	--	10
Nitrate	19	4	0.61 – 9.97	1	0.98	14
LLAGAS SUBBASIN – Principal Aquifer Zone						
Total dissolved solids	31	0	--	0	--	31
Chloride	30	0	--	0	--	30
Nitrate	95	8	0.6 – 3.0	15	0.31 – 7.15	72

4.4.1 Trends for Nitrate (as NO_3^-)

Santa Clara Subbasin

The area overlying the Santa Clara Subbasin consists mostly of urban and suburban development. Almost all areas are served by municipal wastewater systems, thus the use of individual septic systems is rare. While once prevalent, only a few pockets of agricultural land remain today. Nevertheless, nitrate trends were detected at 30 of 237 (13 %) wells analyzed from the Santa Clara Subbasin. Fourteen wells had an upward trend and 16 wells had a downward trend. The magnitude of trend, or rate of change, was estimated for the 14 wells with upward trends and ranged from 0.34 to 2 mg/L/year.

Coyote Subbasin

Land use over the Coyote Subbasin is mixed; the northern portion is predominantly agricultural and the southern portion contains both agricultural use and ranchette style residential development. No municipal wastewater collection system exists in the Coyote Valley, therefore septic systems are common. Nitrate trends were detected at 8 of 25 wells analyzed in the Coyote Subbasin. Four wells had an upward concentration trend and 4 wells had a downward trend. The estimated magnitude of the trend, or rate of change, for the 4 wells with upward trends ranged from 0.6 to 1.2 mg/L/year.

Llagas Subbasin

Land use over the Llagas Subbasin is mostly mixed agricultural and rural residential development, with two main incorporated areas consisting of the cities of Morgan Hill and Gilroy. While the incorporated areas are served by municipal wastewater systems, the unincorporated areas rely on individual septic systems for sanitary waste disposal. Furthermore, the southern portion of the Llagas Subbasin has significant agricultural production. Past land use also included a number of confined animal enclosures. Thus, just about every known source of nitrate is present, or was present at some time, in the Llagas Subbasin. Nitrate trends were detected at 28 of 129 (22 %) wells located in the Llagas subbasin. Twelve wells had an upward trend and 16 wells had a downward trend. Of the 12 wells having an upward trend, the estimate of magnitude of trend ranged from 0.6 to 10 mg/L/year. The median rate of change for these 12 wells is 2 mg/L/year.

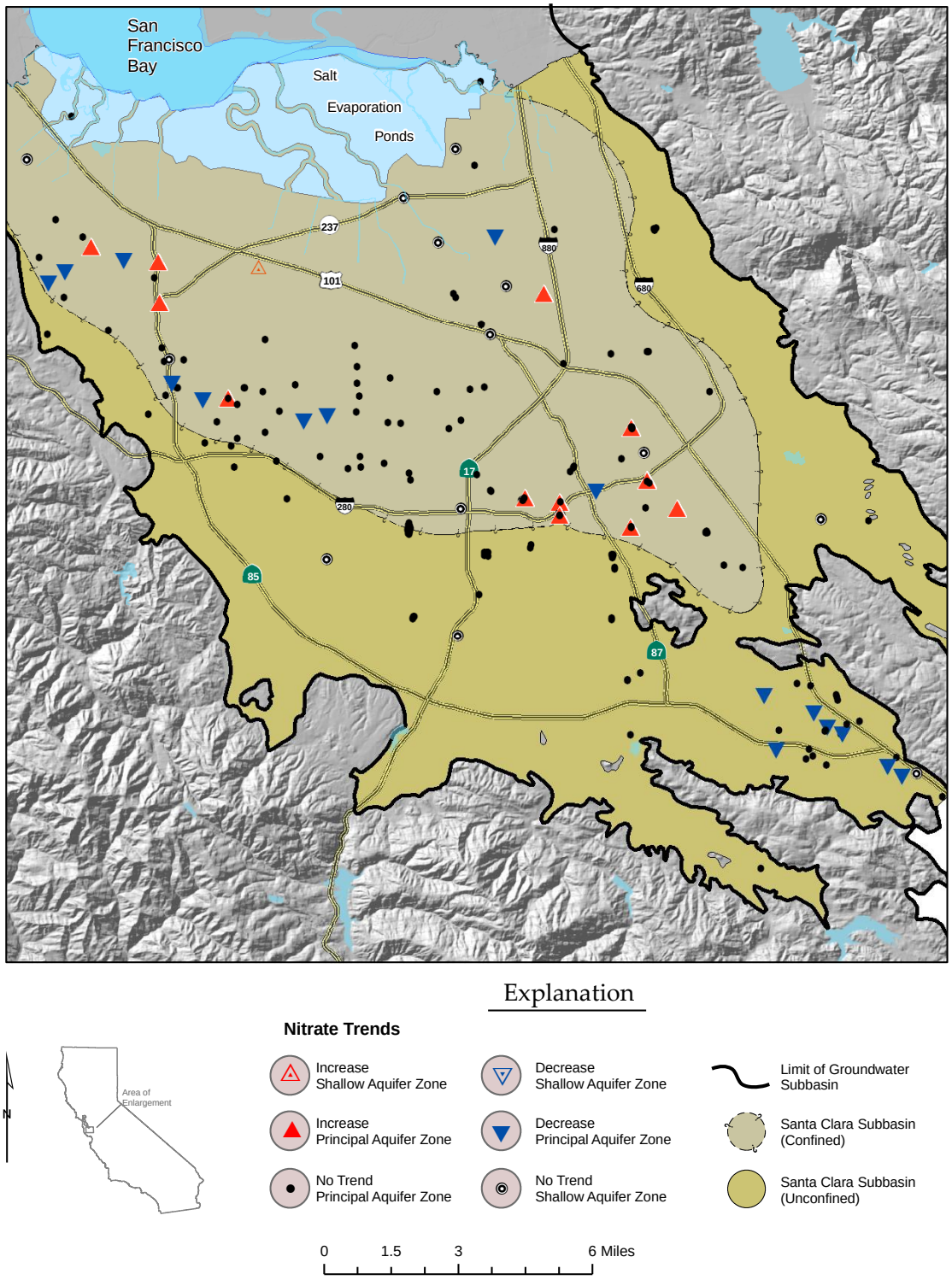

Figure 4-1. Trends in Nitrate
Santa Clara Subbasin, 2000 – 2009

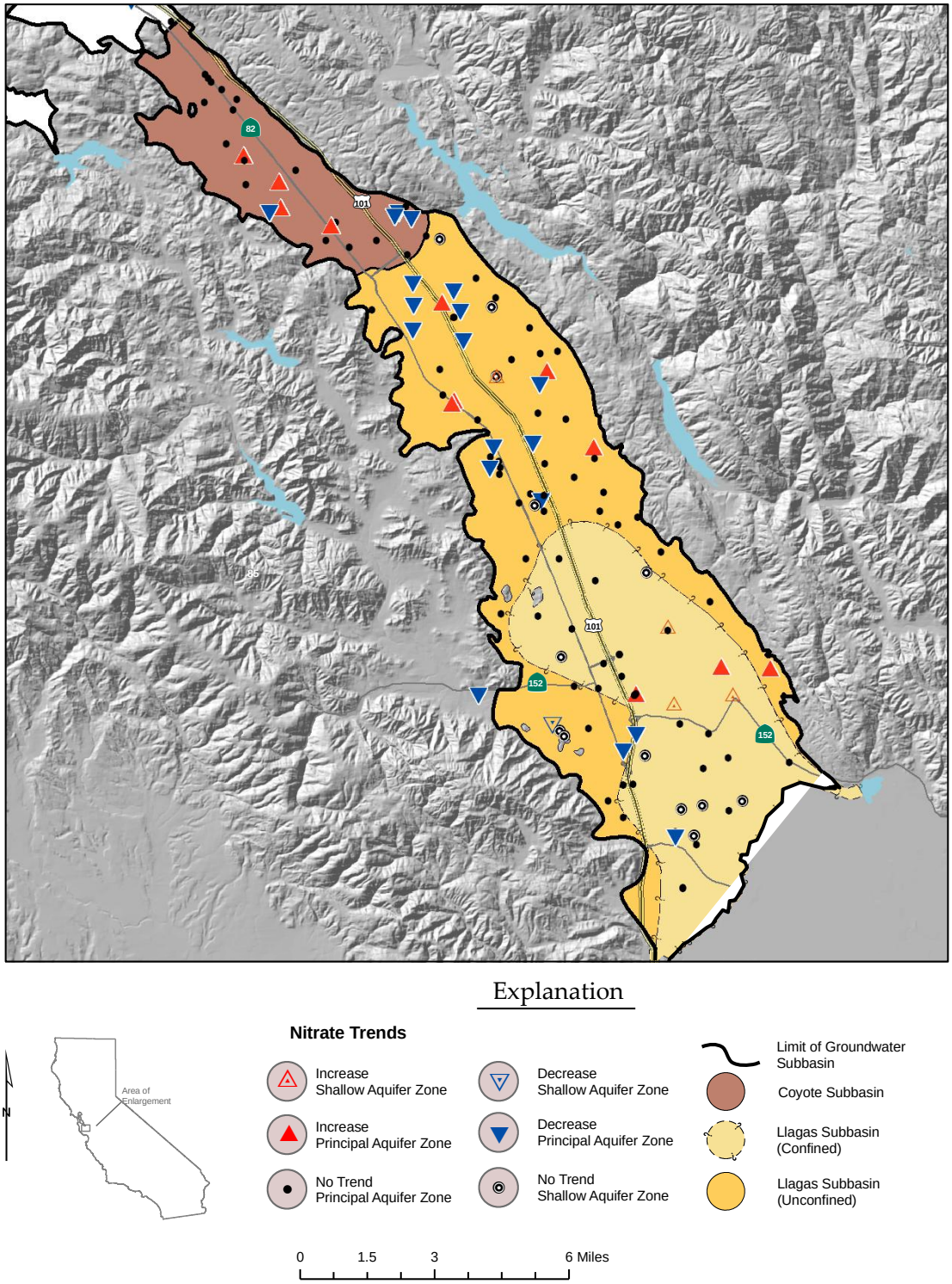

Figure 4-2. Trends in Nitrate
Coyote and Llagas Subbasins, 2000 – 2009

4.4.2 Trends for Chloride

There are several sources of chloride in the environment. These sources may be naturally occurring such as sea spray in coastal areas, bodies of saline water, connate water, and dissolution of evaporate deposits. Anthropogenic sources include wastewater disposal, various industrial processes, and the return of excess irrigation water to groundwater. An increase in chloride content is generally considered deleterious to water quality.

Santa Clara Subbasin

Fifteen wells in the Santa Clara Subbasin had detectable trends in chloride content. Three wells had upward trends and 12 wells had downward trends. Estimates of the magnitude of trend at the three sites having an upward trend ranged from 0.86 to 40 mg/L/year with a median rate of change of about 1.2 mg/L/year. The well with maximum trend magnitude is a shallow well located in region affected by saltwater intrusion. This region is known as the Baylands and is located in the general vicinity of the South San Francisco Bay bounded roughly by Interstate 880 and State Route 101 (Figure 4-3). However, 10 of the 12 wells with downward trend are located within the same region and also tap into the shallow aquifer zone.

Coyote Subbasin

No trends in chloride were detected at the 11 sites analyzed within the Coyote Subbasin.

Llagas Subbasin

Upward trends in chloride were detected at 2 of 12 wells located within the shallow zone of the Llagas Subbasin. The magnitude of trend at these two wells is 1.8 and 3.0 mg/L/year. No trends were detected in the Llagas principal aquifer zone.

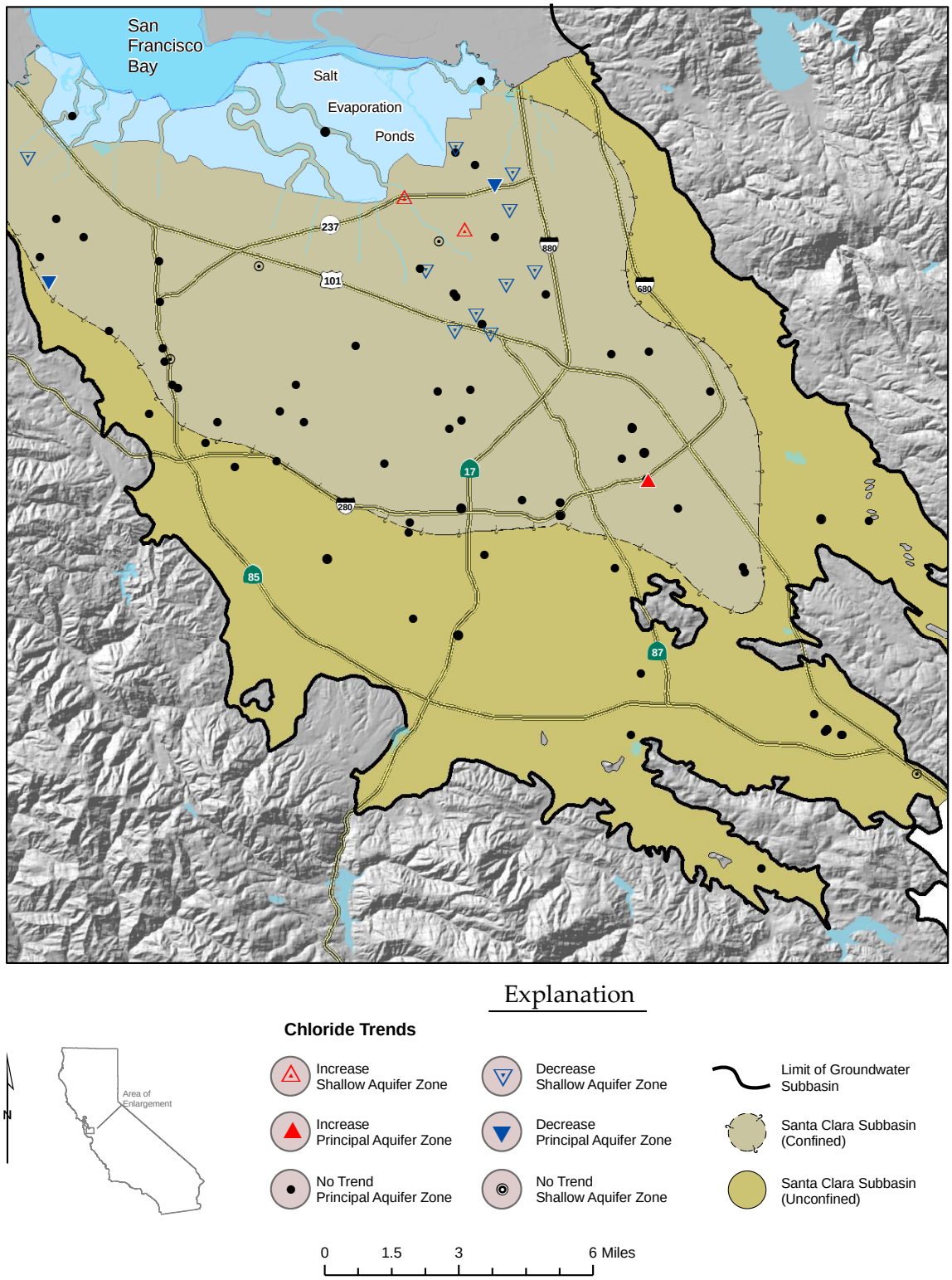

Figure 4-3. Trends in Chloride
Santa Clara Subbasin, 2000 – 2009

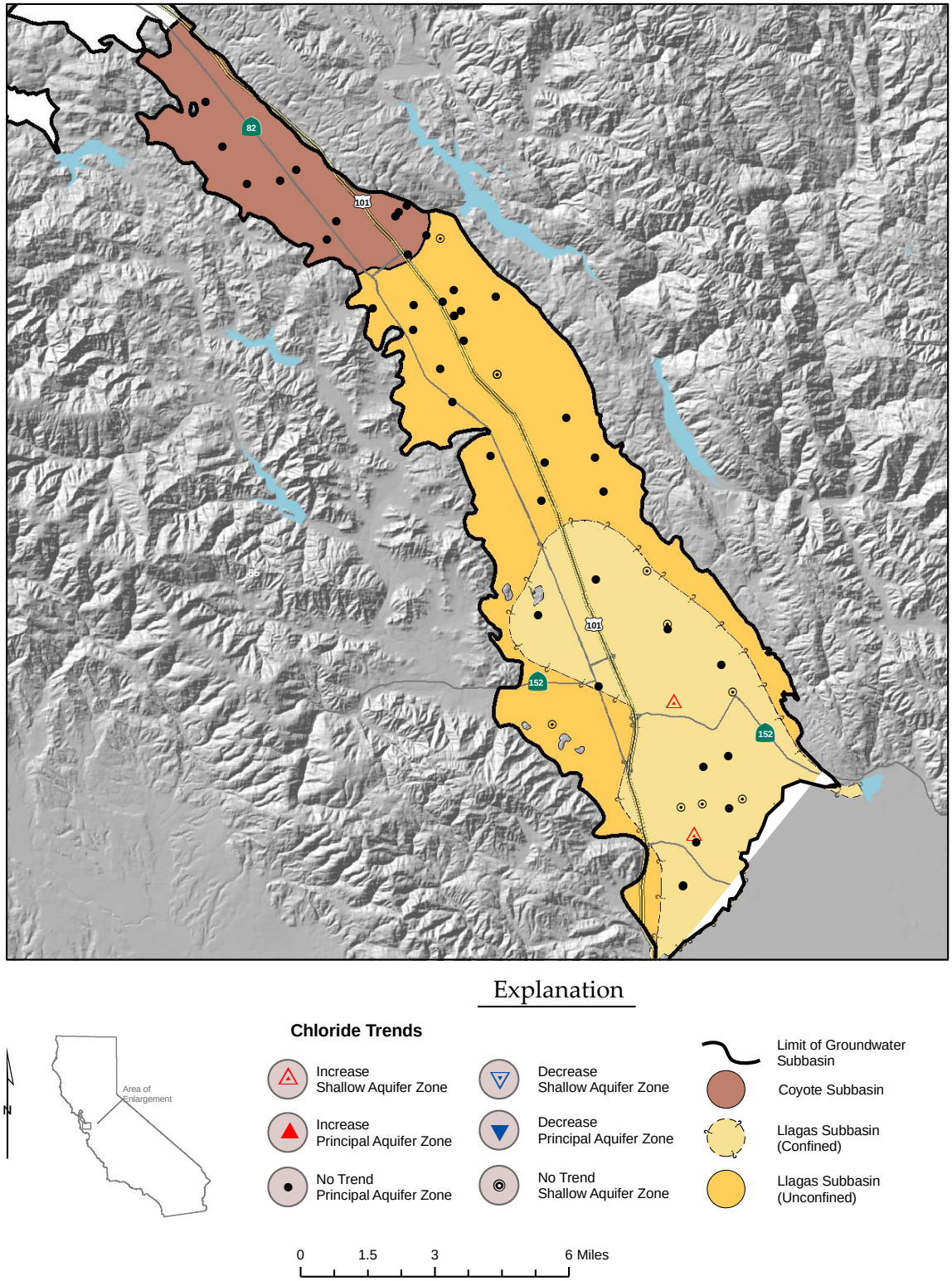

Figure 4-4. Trends in Chloride
Coyote and Llagas Subbasins, 2000 – 2009

4.4.3 Trends for Total Dissolved Solids

Total dissolved solids (TDS) is a measure of the combined content of all inorganic and organic substances in a water sample. It is a prime indicator of the generally suitability of water, especially for domestic and municipal use. Dissolved solids in groundwater are related to the interaction of water with the atmosphere, soil, and rock. Although not considered a “primary” contaminant (one that is deemed to be associated with health effects), it is used as an indication of the aesthetic characteristic of drinking water. Dissolved solids in groundwater can be artificially elevated due to runoff, soil leaching, and land use.

Santa Clara Subbasin

Trends were detected at 7 of 109 wells located in the Santa Clara Subbasin, with four wells having an upward trend and 3 wells having a downward trend. The estimated magnitude of trend at the four wells having an upward trend ranged from 9 to 90.9 mg/L/year. The well indicating the 90.9 mg/L/year increase in TDS between 2000 and 2009 is a shallow saltwater intrusion monitoring well adjacent to the Guadalupe River and just south of Highway 237.

Coyote Subbasin

A statistically significant upward trend for TDS was detected at 1 of 10 sites in the Coyote Subbasin. The magnitude of trend for this well was estimated at 19.8 mg/L/year.

Llagas Subbasin

No trends in TDS were detected in the Llagas Subbasin at the 95% confidence level.

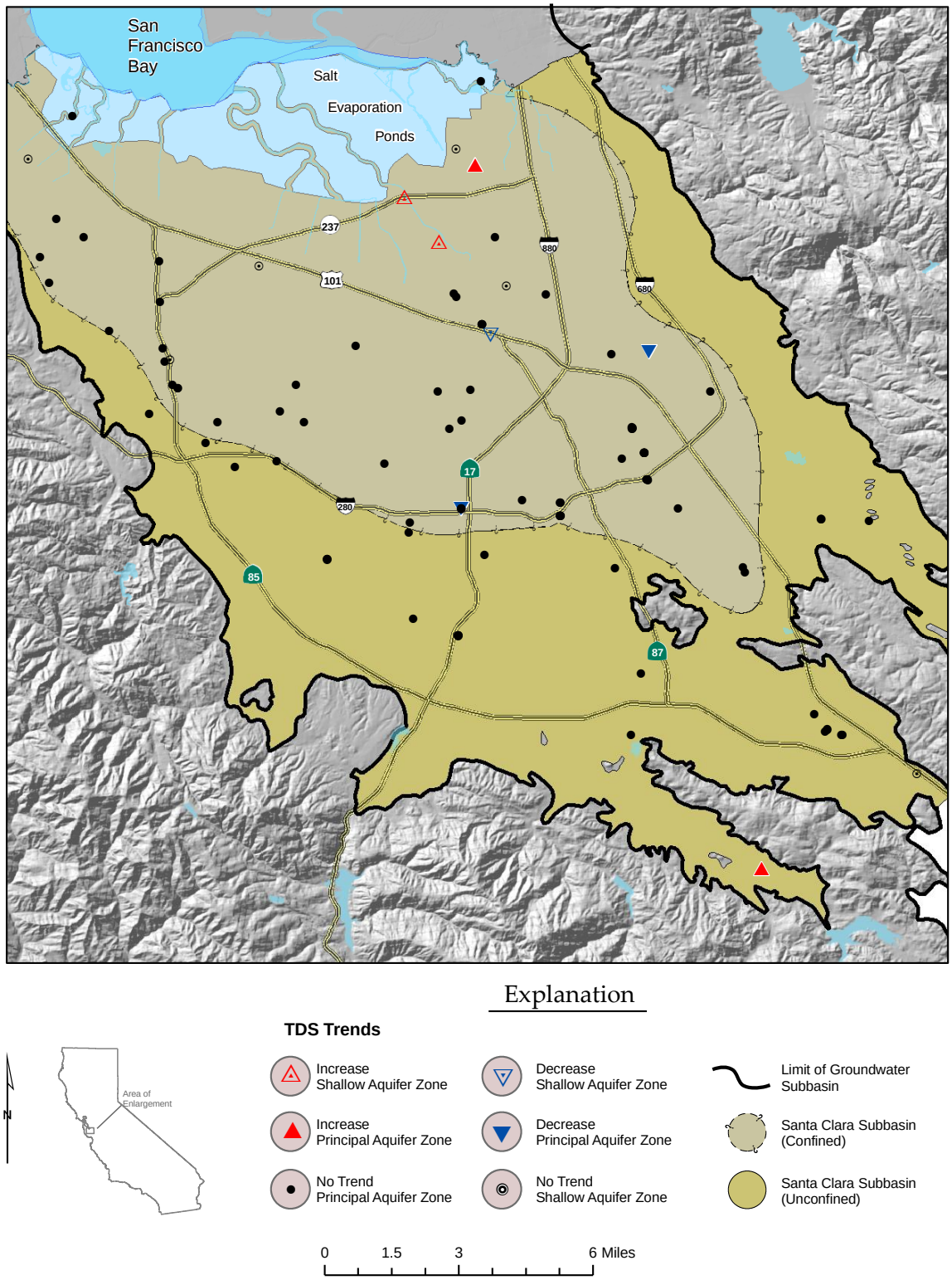

Figure 4-5. Trends in TDS
Santa Clara Subbasin, 2000 – 2009

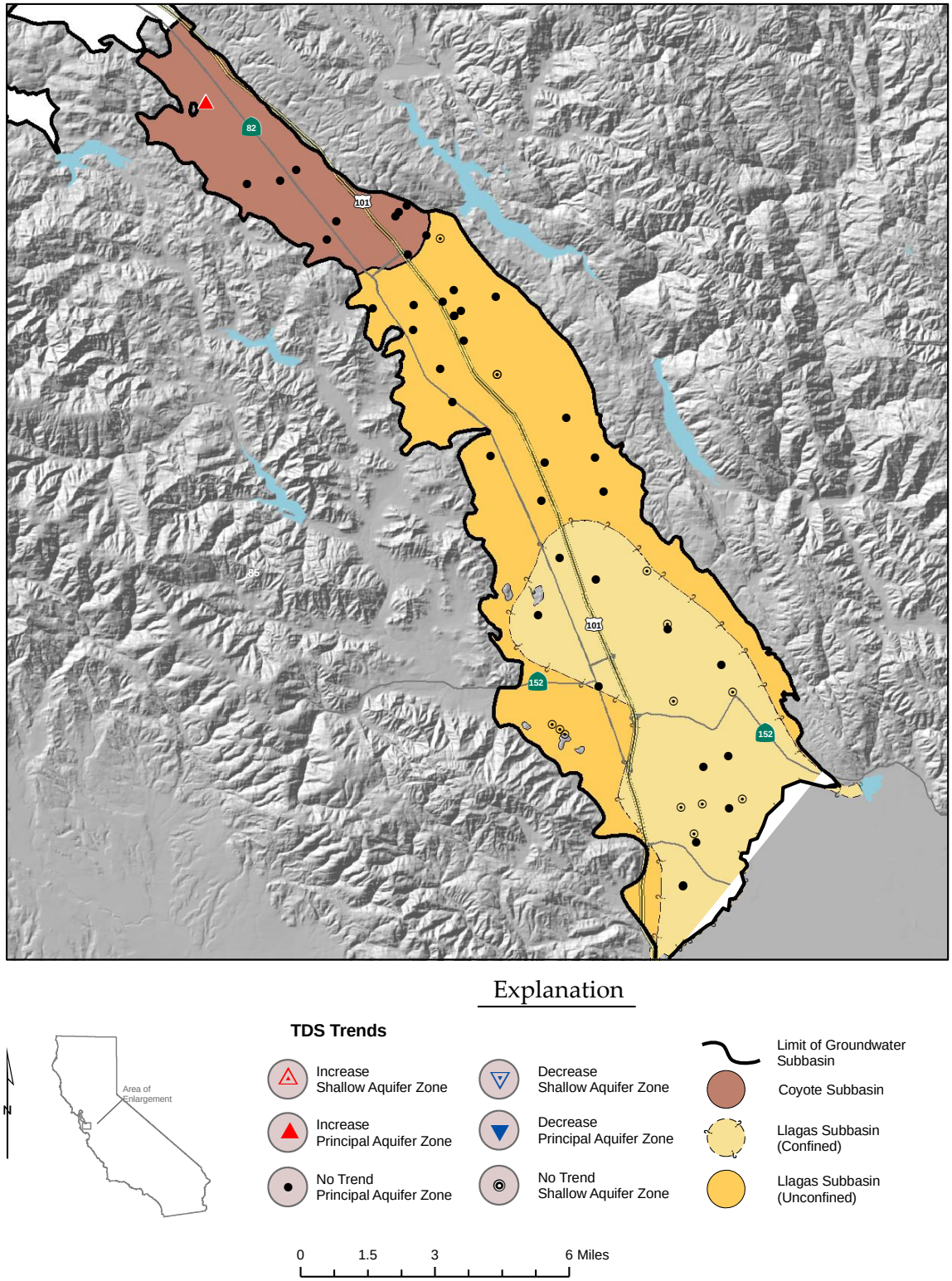

Figure 4-6. Trends in TDS
Coyote and Llagas Subbasins, 2000 – 2009

5.0 2009 Groundwater Quality Monitoring Summary

As part of the District's groundwater quality monitoring program, analytical results from samples collected by the District and water suppliers in calendar year 2009 were evaluated in relation to drinking water standards and agricultural objectives. In addition, temporal trends in water quality were analyzed for nitrate, TDS, and chloride. Water quality indicators, major and minor ions, trace elements, volatile and non-volatile organic compounds (pesticides) were analyzed in as many as 305 wells comprised of mostly municipal or domestic supply wells with a smaller number of dedicated monitoring wells. The majority of wells within Santa Clara County produce high-quality water that meets drinking water standards, and the continued evaluation of regional quality and potential threats helps to ensure high-quality groundwater will continue to be available.

Table 5-1 summarizes which constituents were detected above primary, health-based standards (Maximum Contaminant Levels, or MCLs) in 2009: aluminum, arsenic, barium, nitrate, and perchlorate. For the wells analyzed in this report, primary drinking water standards were exceeded at the following percentage of wells tested: nitrate (8%); perchlorate (2%); and aluminum, arsenic, and barium (<1% each). Detections above MCLs occurred at both monitoring wells and water supply wells.

Table 5-1. Wells with Constituents Exceeding Primary Drinking Water Standards in 2009

Subbasin and Zone	Constituent	Notes
Santa Clara Shallow Zone	Arsenic	Arsenic was detected above the Maximum Contaminant Level (MCL) in one monitoring well.
Santa Clara Principal Zone	Aluminum	Aluminum was detected above the MCL at one public water supply well. Subsequent testing did not confirm the elevated level.
Coyote	Nitrate	Nitrate was detected above the MCL at 2 water supply wells and one domestic supply well.
Llagas Shallow Zone	Nitrate	Nitrate was detected above the MCL at 6 monitoring wells.
Llagas Principal Zone	Nitrate Barium Perchlorate	Nitrate was detected above the MCL at 5 water supply wells (4 public), 6 domestic wells, and 2 monitoring wells. Barium was detected above the MCL at 1 monitoring well. Perchlorate was detected above the MCL at 3 public water supply wells.

Note: For public water supply wells with constituents detected above primary drinking water standards, blending or treatment is required prior to delivery to customers.

The following constituents were detected above secondary, aesthetic-based drinking water standards in 2009: total dissolved solids (TDS), specific conductance, manganese, iron, aluminum, chloride, sulfate, and turbidity. For the wells analyzed in this report, secondary standards were

exceeded at the following percentage of wells tested: TDS (25%), manganese (23%), specific conductance (17%), iron (11%), chloride (4%), turbidity (4%), aluminum (2.5%), and sulfate (2%). It should be noted that the drinking water standards for some constituents, such as TDS, are given as a range by CDPH. For these constituents, the lowest value (recommended limit) was used in this analysis.

Groundwater quality was also evaluated against established agricultural objectives from the appropriate Regional Board Basin Plans. In the Llagas Subbasin, the Central Coast RWQCB's lowest specific conductance objective was exceeded at 28% of wells tested. However, no wells were found to have specific conductance greater than the upper limit at which point severe problems would be expected to occur. The other constituents detected above agricultural objectives in the three subbasins were boron, chloride, copper, iron, manganese, and nitrate + nitrite.

County-wide trend analyses for TDS, chloride, and nitrate were conducted for 164, 177, and 376 well sites, respectively using ten years of data (2000-2009). The majority of wells analyzed for trend did not indicate any statistically significant trend. For the wells analyzed county-wide for trend, there were upward trends for the following percentages of wells: nitrate (8%), TDS (4%), and chloride (3%). For the wells analyzed county-wide for trend, there were downward trends for the following percentages of wells: nitrate (10%), chloride (7%), and TDS (2%). The remaining wells (majority of wells) did not indicate clear evidence of trends. Trends varied by subbasin and zone as shown in Table 5-2 below. District staff will continue to perform trend analysis for select constituents that may provide early warning of potential groundwater degradation.

Analysis of 2009 groundwater quality data from monitoring performed by the District and water suppliers indicates that groundwater in Santa Clara County generally meets drinking water standards. However, some impacts are noted, including elevated nitrate in portions of the Coyote and Llagas Subbasins, and elevated levels of total dissolved solids, specific conductance, manganese and iron at various wells throughout the County. These impacts present some challenges to water suppliers or well owners, who may need to blend or treat the water prior to delivery or use.

In general, the Santa Clara, Coyote, and Llagas Subbasins produce high-quality water and the majority of wells meet drinking water standards without the need for treatment. The District will continue to collect and analyze groundwater quality data to characterize regional groundwater quality, determine the severity and extent of contamination, evaluate changes in water quality over time, and identify potential threats to help ensure the groundwater basins are protected from contamination and the threat of contamination.

Table 5-2. Summary of Trend Analyses (2000-2009)

Constituent	Number of Wells Analyzed[1]	Percent of Wells with Increasing Trends	Percent of Wells with Decreasing Trends	Percent of Wells with no Apparent Trend
Santa Clara Subbasin, Shallow Aquifer Zone				
Total Dissolved Solids	16	13%	6%	81%
Chloride	24	8%	42%	50%
Nitrate	16	6%	0%	94%
Santa Clara Subbasin, Principal Aquifer Zone				
Total Dissolved Solids	93	2%	2%	96%
Chloride	98	1%	2%	97%
Nitrate	221	6%	7%	87%
Coyote Subbasin				
Total Dissolved Solids	10	10%	0%	90%
Chloride	11	0%	0%	100%
Nitrate	25	16%	16%	68%
Llagas Subbasin, Shallow Aquifer Zone				
Total Dissolved Solids	14	0%	0%	100%
Chloride	12	17%	0%	83%
Nitrate	19	21%	5%	74%
Llagas Subbasin, Principal Aquifer Zone				
Total Dissolved Solids	31	0%	0%	100%
Chloride	30	0%	0%	100%
Nitrate	95	8%	16%	76%

Notes:

1. The number of wells tested for trend for each constituent and each zone varies, and was based on the availability of results for each constituent. A minimum of four results between 2000 and 2009 was required for the well to be included in the trend testing for a given constituent.

Appendix A. List of Parameters Analyzed by SCVWD

Constituent	Analytical Method	Parameter Code	Unit
1-1-1-2-TETRACHLORETHANE	EPA 524.2	77562	µg/L
1-1-1-TRICHLOROETHANE	EPA 524.2	34506	µg/L
1-1-2-2-TETRACHLOROETHANE	EPA 524.2	34516	µg/L
1-1-2-TRICHLORO-1-2-2-TRIFLUOROETHANE (FREON 113)	EPA 524.2	81611	µg/L
1-1-2-TRICHLOROETHANE	EPA 524.2	34511	µg/L
1-1-DICHLOROETHANE	EPA 524.2	34496	µg/L
1-1-DICHLOROETHYLENE	EPA 524.2	34501	µg/L
1-1-DICHLOROPROPENE	EPA 524.2	77168	µg/L
1-2-3-TRICHLOROBENZENE	EPA 524.2	77613	µg/L
1-2-4-TRICHLOROBENZENE	EPA 524.2	34551	µg/L
1-2-4-TRIMETHYLBENZENE	EPA 524.2	77222	µg/L
1-2-DICHLOROBENZENE	EPA 524.2	34536	µg/L
1-2-DICHLOROETHANE	EPA 524.2	34531	µg/L
1-2-DICHLOROPROPANE	EPA 524.2	34541	µg/L
1-3-5-TRIMETHYLBENZENE	EPA 524.2	77226	µg/L
1-3-DICHLOROBENZENE	EPA 524.2	34566	µg/L
1-3-DICHLOROPROPANE	EPA 524.2	77173	µg/L
1-3-DICHLOROPROPENE (TOTAL)	EPA 524.2	34561	µg/L
1-4-DICHLOROBENZENE	EPA 524.2	34571	µg/L
1-PHENYLPROPANE (N-PROPYLBENZENE)	EPA 524.2	77224	µg/L
2-2-DICHLOROPROPANE	EPA 524.2	77170	µg/L
2-CHLOROTOLUENE	EPA 524.2	A-008	µg/L
4-CHLOROTOLUENE	EPA 524.2	A-009	µg/L
ALKALINITY (TOTAL) AS CACO3	SM 2320 B	00410	mg/L
ALUMINUM	EPA 200.7	01105	µg/L
ANTIMONY	EPA 200.8	01097	µg/L
ARSENIC	EPA 200.8	01002	µg/L
BARIUM	EPA 200.7	01007	µg/L
BENZENE	EPA 524.2	34030	µg/L
BERYLLIUM	EPA 200.8	01012	µg/L
BICARBONATE (AS HCO3)	SM 2320 B	00440	mg/L
BORON	EPA 200.7	01020	µg/L
BROMIDE	EPA 300.0	82298	mg/L
BROMOBENZENE	EPA 524.2	81555	µg/L
BROMOCHLOROMETHANE	EPA 524.2	A-012	µg/L
BROMODICHLOROMETHANE (THM)	EPA 524.2	32101	µg/L
BROMOFORM (THM)	EPA 524.2	32104	µg/L
BROMOMETHANE	EPA 524.2	34413	µg/L
CADMIUM	EPA 200.8	01027	µg/L
CALCIUM	EPA 200.7	00916	mg/L
CALCIUM AS CACO3	EPA 200.7	00910	mg/L
CARBON TETRACHLORIDE	EPA 524.2	32102	µg/L
CARBONATE ALKALINITY	SM 2320 B	00445	mg/L
CHLORIDE	SM 4500-Cl D	00940	mg/L
CHLOROETHANE	EPA 524.2	34311	µg/L
CHLOROFORM (THM)	EPA 524.2	32106	µg/L
CHLOROMETHANE	EPA 524.2	34418	µg/L
CHROMIUM- (TOTAL)	EPA 200.8	01034	µg/L
CIS-1-2-DICHLOROETHYLENE	EPA 524.2	77093	µg/L
CIS-1-3-DICHLOROPROPENE	EPA 524.2	34704	µg/L
COPPER	EPA 200.8	01042	µg/L
DIBROMOCHLOROMETHANE (THM)	EPA 524.2	32105	µg/L
DIBROMOMETHANE	EPA 524.2	77596	µg/L
DICHLORODIFLUOROMETHANE (FREON 12)	EPA 524.2	34668	µg/L
DICHLOROMETHANE	EPA 524.2	34423	µg/L
DIISOPROPYL ETHER	EPA 524.2	A-036	µg/L
ETHYLBENZENE	EPA 524.2	34371	µg/L
ETHYL-TERT-BUTYL ETHER	EPA 524.2	A-033	µg/L
FLUORIDE (NATURAL SOURCE)	EPA 300.0	00951	mg/L
HARDNESS (TOTAL) AS CAC03	SM 2340 C	00900	mg/L

Constituent	Analytical Method	Parameter Code	Unit
HEXACHLOROBUTADIENE	EPA 524.2	34391	µg/L
HYDROXIDE ALKALINITY	SM 2320 B	71830	mg/L
IRON	EPA 200.7	01045	µg/L
ISOPROPYLBENZENE	EPA 524.2	77223	µg/L
LEAD	EPA 200.8	01051	µg/L
MAGNESIUM	EPA 200.7	00927	mg/L
MANGANESE	EPA 200.7	01055	µg/L
MERCURY	EPA 245.1	71900	µg/L
METHYL-TERT-BUTYL-ETHER (MTBE)	EPA 524.2	46491	µg/L
MONOCHLOROBENZENE	EPA 524.2	34301	µg/L
M-P-XYLENE	EPA 524.2	A-014	µg/L
NAPHTHALENE	EPA 524.2	34696	µg/L
N-BUTYLBENZENE	EPA 524.2	A-010	µg/L
NICKEL	EPA 200.8	01067	µg/L
NITRATE (AS NO3)	EPA 300.0	71850	mg/L
O-XYLENE	EPA 524.2	77135	µg/L
PERCHLORATE	EPA 314.0	A-031	µg/L
PH- LABORATORY	SM 4500-H+	00403	pH units
PHOSPHATE	EPA 300.0	00650	mg/L
P-ISOPROPYLTOLUENE	EPA 524.2	A-011	µg/L
POTASSIUM	EPA 200.7	00937	mg/L
SEC-BUTYLBENZENE	EPA 524.2	77350	µg/L
SELENIUM	EPA 200.8	01147	µg/L
SILICA	EPA 200.7	00955	mg/L
SILVER	EPA 200.8	01077	µg/L
SODIUM	EPA 200.7	00929	mg/L
SPECIFIC CONDUCTANCE	SM 2510 B	00095	µS/cm
STYRENE	EPA 524.2	77128	µg/L
SULFATE	EPA 300.0	00945	mg/L
TERT-AMYL-METHYL ETHER	EPA 524.2	A-034	µg/L
TERT-BUTYL ALCOHOL	EPA 524.2	77035	µg/L
TERT-BUTYLBENZENE	EPA 524.2	77353	µg/L
TETRACHLOROETHYLENE	EPA 524.2	34475	µg/L
THALLIUM	EPA 200.8	01059	µg/L
TOLUENE	EPA 524.2	34010	µg/L
TOTAL DISSOLVED SOLIDS	SM 2540 C	70300	mg/L
TRANS-1-2-DICHLOROETHYLENE	EPA 524.2	34546	µg/L
TRANS-1-3-DICHLOROPROPENE	EPA 524.2	34699	µg/L
TRICHLOROETHYLENE	EPA 524.2	39180	µg/L
TRICHLOROFLUOROMETHANE (FREON 11)	EPA 524.2	34488	µg/L
TURBIDITY- LABORATORY	SM 2130 B	82079	NTU
VANADIUM	EPA 200.8	01087	µg/L
VINYL CHLORIDE	EPA 524.2	39175	µg/L
XYLENES (TOTAL)	EPA 524.2	81551	µg/L
ZINC	EPA 200.7	01092	µg/L

Notes: mg/L = milligrams per liter; µg/L = micrograms per liter; µS/cm = microSiemens per centimeter; NTU = Nephelometric Turbidity Units

Appendix B. Mann-Kendall Results for Wells with Statistically Significant Upward Concentration Trend, 2000 - 2009.

Masked Well ID	Constituent	n	S	z	*p* value	τ	Magnitude of Trend
			Santa Clara Subbasin				
SC-22	Chloride	13	57	3.42	0.001	0.73	39.99
SC-95	Chloride	5	10	2.21	0.028	1	1.22
SC-28	Chloride	13	35	2.1	0.036	0.45	0.87
SC-155	Nitrate	10	23	1.97	0.049	0.51	2.13
SC-106	Nitrate	5	10	2.21	0.028	1	1.77
SC-53	Nitrate	20	64	2.04	0.041	0.34	1.02
SC-58	Nitrate	23	109	2.68	0.007	0.39	0.95
SC-103	Nitrate	25	105	2.43	0.015	0.35	0.95
SC-57	Nitrate	8	22	2.6	0.009	0.79	0.79
SC-91	Nitrate	9	20	1.98	0.048	0.56	0.76
SC-12	Nitrate	9	23	2.34	0.019	0.64	0.63
SC-96	Nitrate	10	29	2.5	0.012	0.64	0.63
SC-55	Nitrate	20	98	3.16	0.002	0.52	0.61
SC-80	Nitrate	5	10	2.21	0.028	1	0.52
SC-90	Nitrate	21	72	2.15	0.031	0.34	0.5
SC-116	Nitrate	8	17	2	0.046	0.61	0.39
SC-208	Nitrate	37	179	2.34	0.02	0.27	0.34
SC-22	Total dissolved solids	9	28	2.82	0.005	0.78	90.98
SC-22	Total dissolved solids	9	22	2.19	0.029	0.61	33.76
SC-233	Total dissolved solids	6	15	2.63	0.009	1	9.64
SC-23	Total dissolved solids	9	25	2.52	0.012	0.69	9.01
			Coyote Subbasin				
C-10	Nitrate	12	32	2.13	0.034	0.48	1.22
C-11	Nitrate	6	13	2.25	0.024	0.87	1.13
C-18	Nitrate	10	26	2.68	0.008	0.72	0.75
C-15	Nitrate	20	81	2.65	0.008	0.43	0.58
C-6	Total dissolved solids	7	19	2.7	0.007	0.9	19.8
			Llagas Subbasin				
L-111	Chloride	11	29	2.19	0.028	0.53	3
L-80	Chloride	9	27	2.73	0.006	0.75	1.81
L-25	Nitrate	16	92	4.1	0	0.77	9.97
L-80	Nitrate	18	111	4.17	0	0.73	6.95
L-64	Nitrate	13	40	2.38	0.017	0.51	4.91
L-73	Nitrate	13	42	2.5	0.012	0.54	3.04
L-26	Nitrate	13	58	3.48	0.001	0.74	2.34
L-23	Nitrate	15	65	3.18	0.002	0.62	1.96
L-21	Nitrate	35	244	3.61	0	0.43	1.85
L-53	Nitrate	10	32	2.81	0.005	0.71	0.99
L-7	Nitrate	10	24	2.42	0.015	0.67	0.81
L-74	Nitrate	8	21	2.53	0.011	0.75	0.74
L-79	Nitrate	16	47	2.07	0.038	0.39	0.61
L-82	Nitrate	10	29	2.55	0.011	0.64	0.6

Notes: n = number of data records; S = Mann-Kendall test statistic, z = Mann-Kendall statistic (S) converted to test statistic that is approximated by a normal distribution; *p* value = probability of getting the observed value of τ, or one more extreme, when the null hypothesis is true; τ = Kendall's tau (correlation coefficient); magnitude of trend = median slope of all pair-wise slopes.

Appendix C. Mann-Kendall Results for Wells with Statistically Significant Downward Concentration Trend, 2000 - 2009.

Masked Well ID	Constituent	n	S	z	*p* value	τ	Magnitude of Trend
			Santa Clara Subbasin				
SC-18	Chloride	13	-40	-2.379	0.017	-0.51	-134.85
SC-36	Chloride	12	-60	-4.046	0.000	-0.91	-8.19
SC-45	Chloride	15	-50	-2.434	0.015	-0.48	-4.15
SC-25	Chloride	6	-12	-2.104	0.035	-0.8	-4.03
SC-26	Chloride	12	-48	-3.238	0.001	-0.73	-3.73
SC-47	Chloride	15	-66	-3.221	0.001	-0.63	-2.58
SC-24	Chloride	11	-32	-2.421	0.016	-0.58	-2.11
SC-33	Chloride	15	-88	-4.321	0.000	-0.84	-1.65
SC-37	Chloride	12	-45	-3.058	0.002	-0.68	-1.49
SC-30	Chloride	12	-47	-3.197	0.001	-0.71	-1.21
SC-52	Chloride	9	-21	-2.097	0.036	-0.58	-1.21
SC-32	Chloride	13	-49	-2.96	0.003	-0.63	-1.16
SC-215	Nitrate	15	-51	-2.486	0.013	-0.49	-3.35
SC-230	Nitrate	6	-13	-2.254	0.024	-0.87	-1.77
SC-238	Nitrate	5	-10	-2.205	0.028	-1	-1.63
SC-138	Nitrate	5	-10	-2.205	0.028	-1	-1.31
SC-216	Nitrate	11	-31	-2.335	0.019	-0.56	-1.26
SC-244	Nitrate	8	-24	-2.846	0.004	-0.86	-1.06
SC-52	Nitrate	10	-27	-2.326	0.020	-0.6	-1.00
SC-54	Nitrate	16	-42	-1.554	0.120	-0.27	-0.85
SC-240	Nitrate	9	-23	-2.368	0.018	-0.64	-0.78
SC-250	Nitrate	7	-17	-2.4	0.016	-0.81	-0.77
SC-232	Nitrate	6	-12	-2.215	0.027	-0.8	-0.65
SC-27	Nitrate	6	-12	-2.07	0.039	-0.8	-0.62
SC-100	Nitrate	10	-24	-2.065	0.039	-0.53	-0.61
SC-249	Nitrate	7	-21	-3.004	0.003	-1	-0.40
SC-51	Nitrate	33	-158	-2.437	0.015	-0.3	-0.38
SC-141	Nitrate	35	-275	-3.895	0.000	-0.46	-0.38
SC-161	Total dissolved solids	5	-6	-1.698	0.086	-1	-15.55
SC-15	Total dissolved solids	6	-12	-2.104	0.035	-0.8	-10.66
SC-45	Total dissolved solids	7	-50	-2.434	0.015	-0.48	-4.15
			Coyote Subbasin				
C-16	Nitrate	20	-85	-2.548	0.011	-0.4	-0.77
C-22	Nitrate	10	-32	-2.887	0.004	-0.71	-0.61
C-20	Nitrate	9	-29	-2.935	0.003	-0.81	-0.30
C-19	Nitrate	10	-27	-2.397	0.017	-0.6	-0.25
			Llagas Subbasin				
L-109	Nitrate	7	-21	-3.004	0.003	-1	-7.15
L-31	Nitrate	14	-41	-2.203	0.028	-0.45	-2.83
L-36	Nitrate	14	-49	-2.636	0.008	-0.54	-1.55
L-40	Nitrate	15	-59	-2.877	0.004	-0.56	-1.34
L-18	Nitrate	10	-37	-3.282	0.001	-0.82	-1.24
L-6	Nitrate	10	-30	-2.633	0.009	-0.67	-1.00
L-27	Nitrate	8	-25	-2.991	0.003	-0.89	-1.00
L-75	Nitrate	8	-24	-2.846	0.004	-0.86	-0.98
L-92	Nitrate	8	-26	-3.093	0.002	-0.93	-0.97
L-76	Nitrate	15	-59	-2.877	0.004	-0.56	-0.95
L-30	Nitrate	10	-26	-2.263	0.024	-0.58	-0.88
L-8	Nitrate	10	-31	-2.705	0.007	-0.69	-0.50
L-19	Nitrate	9	-23	-2.552	0.011	-0.64	-0.50
L-5	Nitrate	15	-54	-2.626	0.009	-0.51	-0.45
L-91	Nitrate	10	-28	-2.514	0.012	-0.62	-0.33
L-9	Nitrate	8	-19	-2.413	0.016	-0.68	-0.31

Notes: n = number of data records; S = Mann-Kendall test statistic, z = Mann-Kendall statistic (S) converted to test statistic that is approximated by a normal distribution; *p* value = probability of getting the observed value of τ, or one more extreme, when the null hypothesis is true; τ = Kendall's tau (correlation coefficient); magnitude of trend = median slope of all pair-wise slopes.

Appendix D. Mann-Kendall Results for Wells with no Statistically Significant Concentration Trend, 2000 - 2009.

Masked Well ID	Constituent	n	S	z	*p* value	τ
		Santa Clara Subbasin				
SC-1	Chloride	15	-32	-1.53	0.126	-0.3
SC-3	Chloride	4	-4	-1.02	0.334	-0.67
SC-4	Chloride	4	-4	-1.02	0.334	-0.67
SC-5	Chloride	5	-4	-0.73	0.484	-0.4
SC-6	Chloride	6	6	0.94	0.370	0.4
SC-11	Chloride	6	5	0.75	0.470	0.33
SC-14	Chloride	8	-14	-1.61	0.108	-0.5
SC-15	Chloride	6	-3	-0.38	0.720	-0.2
SC-17	Chloride	7	-8	-1.05	0.310	-0.38
SC-19	Chloride	8	5	0.49	0.634	0.18
SC-20	Chloride	7	11	1.5	0.136	0.52
SC-21	Chloride	7	6	0.75	0.472	0.29
SC-23	Chloride	17	-48	-1.94	0.052	-0.35
SC-27	Chloride	5	1	0	1.000	0.1
SC-29	Chloride	15	29	1.39	0.168	0.28
SC-31	Chloride	6	10	1.69	0.096	0.67
SC-34	Chloride	6	1	0	1.000	0.07
SC-35	Chloride	6	5	0.75	0.470	0.33
SC-38	Chloride	5	-3	-0.49	0.650	-0.3
SC-39	Chloride	4	0	0	1.250	0
SC-40	Chloride	6	-7	-1.13	0.272	-0.47
SC-41	Chloride	6	-8	-1.32	0.204	-0.53
SC-42	Chloride	4	3	0.68	0.542	0.5
SC-46	Chloride	4	3	0.68	0.542	0.5
SC-48	Chloride	15	-29	-1.39	0.168	-0.28
SC-49	Chloride	7	0	0	1.126	0
SC-50	Chloride	4	6	1.7	0.084	1
SC-55	Chloride	4	0	0	1.250	0
SC-57	Chloride	14	24	1.26	0.212	0.26
SC-58	Chloride	5	-7	-1.47	0.158	-0.7
SC-61	Chloride	4	6	1.7	0.084	1
SC-62	Chloride	6	-3	-0.38	0.720	-0.2
SC-63	Chloride	4	4	1.02	0.334	0.67
SC-64	Chloride	8	2	0.12	0.904	0.07
SC-67	Chloride	12	-23	-1.51	0.134	-0.35
SC-74	Chloride	7	3	0.3	0.772	0.14
SC-77	Chloride	4	2	0.34	0.750	0.33
SC-78	Chloride	4	4	1.02	0.334	0.67
SC-79	Chloride	4	6	1.7	0.084	1
SC-81	Chloride	4	-2	-0.34	0.750	-0.33
SC-82	Chloride	6	-1	0	1.000	-0.07
SC-84	Chloride	4	4	1.02	0.334	0.67
SC-85	Chloride	6	-7	-1.13	0.272	-0.47
SC-86	Chloride	6	-4	-0.56	0.594	-0.27
SC-87	Chloride	5	-7	-1.47	0.158	-0.7
SC-88	Chloride	5	0	0	1.184	0
SC-89	Chloride	7	-8	-1.05	0.310	-0.38
SC-90	Chloride	6	-1	0	1.000	-0.07
SC-91	Chloride	4	2	0.34	0.750	0.33
SC-92	Chloride	4	-2	-0.34	0.750	-0.33
SC-93	Chloride	4	3	0.68	0.542	0.5
SC-102	Chloride	4	4	1.02	0.334	0.67
SC-103	Chloride	4	6	1.7	0.084	1

Masked Well ID	Constituent	n	S	z	*p* value	τ
Santa Clara Subbasin (continued)						
SC-105	Chloride	6	-3	-0.38	0.720	-0.2
SC-106	Chloride	4	4	1.02	0.334	0.67
SC-107	Chloride	5	0	0	1.184	0
SC-108	Chloride	6	2	0.19	0.860	0.13
SC-109	Chloride	5	0	0	1.184	0
SC-123	Chloride	5	-2	-0.24	0.816	-0.2
SC-124	Chloride	5	6	1.22	0.234	0.6
SC-126	Chloride	4	0	0	1.250	0
SC-131	Chloride	4	3	0.68	0.542	0.5
SC-132	Chloride	4	-2	-0.34	0.750	-0.33
SC-133	Chloride	4	5	1.36	0.208	0.83
SC-139	Chloride	5	2	0.24	0.816	0.2
SC-140	Chloride	4	-2	-0.34	0.750	-0.33
SC-141	Chloride	9	-8	-0.73	0.476	-0.22
SC-142	Chloride	4	0	0	1.250	0
SC-146	Chloride	4	6	1.7	0.084	1
SC-148	Chloride	4	2	0.34	0.750	0.33
SC-153	Chloride	4	-4	-1.02	0.334	-0.67
SC-160	Chloride	4	4	1.02	0.334	0.67
SC-161	Chloride	5	-6	-1.22	0.234	-0.6
SC-162	Chloride	5	-4	-0.73	0.484	-0.4
SC-163	Chloride	6	2	0.19	0.860	0.13
SC-169	Chloride	4	6	1.7	0.084	1
SC-179	Chloride	4	-4	-1.02	0.334	-0.67
SC-186	Chloride	6	-5	-0.75	0.470	-0.33
SC-191	Chloride	4	4	1.02	0.334	0.67
SC-192	Chloride	4	-3	-0.68	0.542	-0.5
SC-193	Chloride	5	-3	-0.49	0.650	-0.3
SC-195	Chloride	6	5	0.75	0.470	0.33
SC-199	Chloride	4	4	1.02	0.334	0.67
SC-200	Chloride	6	5	0.75	0.470	0.33
SC-201	Chloride	5	-4	-0.73	0.484	-0.4
SC-202	Chloride	6	-9	-1.5	0.136	-0.6
SC-203	Chloride	4	-4	-1.02	0.334	-0.67
SC-204	Chloride	5	2	0.24	0.816	0.2
SC-205	Chloride	4	-4	-1.02	0.334	-0.67
SC-206	Chloride	7	11	1.5	0.136	0.52
SC-213	Chloride	4	5	1.36	0.208	0.83
SC-214	Chloride	4	1	0	1.000	0.17
SC-216	Chloride	4	-4	-1.02	0.334	-0.67
SC-218	Chloride	4	5	1.36	0.208	0.83
SC-219	Chloride	4	-4	-1.02	0.334	-0.67
SC-220	Chloride	8	-16	-1.86	0.062	-0.57
SC-224	Chloride	4	4	1.02	0.334	0.67
SC-226	Chloride	7	5	0.6	0.562	0.24
SC-229	Chloride	4	6	1.7	0.084	1
SC-233	Chloride	6	2	0.19	0.860	0.13
SC-238	Chloride	6	6	0.94	0.370	0.4
SC-239	Chloride	4	4	1.02	0.334	0.67
SC-240	Chloride	5	4	0.73	0.484	0.4
SC-241	Chloride	4	6	1.7	0.084	1
SC-243	Chloride	5	5	0.98	0.358	0.5
SC-244	Chloride	4	3	0.68	0.542	0.5
SC-248	Chloride	8	16	1.86	0.062	0.57
SC-1	Nitrate	10	3	0.26	0.796	0.07
SC-2	Nitrate	6	-5	-0.9	0.470	-0.33
SC-3	Nitrate	4	0	0	1.250	0

Masked Well ID	Constituent	n	S	z	*p* value	τ
Santa Clara Subbasin (continued)						
SC-4	Nitrate	4	-1	0	1.000	-0.17
SC-5	Nitrate	5	0	0	0.484	0
SC-6	Nitrate	6	3	0.59	0.720	0.2
SC-7	Nitrate	10	9	0.72	0.484	0.2
SC-8	Nitrate	6	-3	-0.38	0.720	-0.2
SC-9	Nitrate	7	-1	0	1.000	-0.05
SC-10	Nitrate	10	-3	-0.18	0.862	-0.07
SC-11	Nitrate	10	7	0.54	0.600	0.16
SC-13	Nitrate	4	-2	-0.34	0.750	-0.33
SC-14	Nitrate	13	4	0.18	0.858	0.05
SC-15	Nitrate	29	34	0.62	0.540	0.08
SC-16	Nitrate	8	-12	-1.36	0.178	-0.43
SC-18	Nitrate	9	0	0	0.840	0
SC-22	Nitrate	9	0	0	0.840	0
SC-23	Nitrate	9	0	0	1.000	0
SC-29	Nitrate	9	0	0	1.000	0
SC-33	Nitrate	9	2	0.19	0.840	0.06
SC-34	Nitrate	5	-9	-1.96	0.050	-0.9
SC-35	Nitrate	9	-15	-1.46	0.150	-0.42
SC-38	Nitrate	4	0	0	1.000	0
SC-40	Nitrate	5	-4	-0.73	0.484	-0.4
SC-41	Nitrate	5	0	0	1.184	0
SC-42	Nitrate	4	-1	0	1.000	-0.17
SC-43	Nitrate	12	-24	-1.58	0.116	-0.36
SC-44	Nitrate	4	-5	-1.36	0.208	-0.83
SC-45	Nitrate	7	13	1.8	0.070	0.62
SC-46	Nitrate	4	-1	0	1.000	-0.17
SC-47	Nitrate	9	16	1.56	0.120	0.44
SC-48	Nitrate	9	-8	-0.81	0.476	-0.22
SC-49	Nitrate	27	78	1.61	0.108	0.22
SC-50	Nitrate	10	-9	-0.72	0.484	-0.2
SC-56	Nitrate	4	0	0	1.250	0
SC-59	Nitrate	8	11	1.24	0.226	0.39
SC-60	Nitrate	8	1	0	1.000	0.04
SC-61	Nitrate	21	44	1.3	0.196	0.21
SC-62	Nitrate	10	1	0	1.000	0.02
SC-63	Nitrate	4	3	0.68	0.542	0.5
SC-64	Nitrate	10	22	1.88	0.058	0.49
SC-65	Nitrate	4	6	1.7	0.084	1
SC-66	Nitrate	27	-36	-0.73	0.468	-0.1
SC-67	Nitrate	8	0	0	1.000	0
SC-68	Nitrate	6	0	0	1.000	0
SC-69	Nitrate	8	-2	-0.12	0.904	-0.07
SC-70	Nitrate	7	1	0	1.000	0.05
SC-71	Nitrate	7	4	0.45	0.666	0.19
SC-72	Nitrate	4	0	0	1.000	0
SC-73	Nitrate	5	0	0	1.000	0
SC-74	Nitrate	12	1	0	1.000	0.02
SC-75	Nitrate	12	-25	-1.65	0.100	-0.38
SC-76	Nitrate	5	2	0.24	0.816	0.2
SC-77	Nitrate	15	-24	-1.14	0.260	-0.23
SC-78	Nitrate	11	-3	-0.16	0.880	-0.05
SC-79	Nitrate	7	-1	0	1.000	-0.05
SC-81	Nitrate	7	10	1.35	0.186	0.48
SC-82	Nitrate	8	16	1.86	0.062	0.57
SC-83	Nitrate	6	3	0.38	0.720	0.2
SC-84	Nitrate	7	7	0.9	0.382	0.33

Masked Well ID	Constituent	n	S	z	*p* value	τ
Santa Clara Subbasin (continued)						
SC-85	Nitrate	4	0	0	1.250	0
SC-86	Nitrate	4	0	0	1.250	0
SC-87	Nitrate	4	2	0.34	0.750	0.33
SC-88	Nitrate	5	6	1.22	0.234	0.6
SC-89	Nitrate	6	7	1.13	0.272	0.47
SC-92	Nitrate	8	7	0.74	0.472	0.25
SC-93	Nitrate	15	-2	-0.05	0.960	-0.02
SC-94	Nitrate	8	-15	-1.73	0.084	-0.54
SC-95	Nitrate	8	12	1.36	0.178	0.43
SC-97	Nitrate	12	11	0.69	0.502	0.17
SC-98	Nitrate	7	14	1.95	0.050	0.67
SC-99	Nitrate	14	-13	-0.66	0.518	-0.14
SC-101	Nitrate	30	-89	-1.57	0.118	-0.2
SC-102	Nitrate	10	4	0.27	0.794	0.09
SC-104	Nitrate	30	67	1.18	0.242	0.15
SC-105	Nitrate	6	1	0	1.000	0.07
SC-107	Nitrate	4	2	0.34	0.750	0.33
SC-108	Nitrate	5	-4	-0.73	0.484	-0.4
SC-109	Nitrate	4	2	0.34	0.750	0.33
SC-110	Nitrate	6	3	0.38	0.720	0.2
SC-111	Nitrate	4	-4	-1.02	0.334	-0.67
SC-112	Nitrate	8	-2	-0.12	0.904	-0.07
SC-113	Nitrate	7	-4	-0.45	0.666	-0.19
SC-114	Nitrate	6	1	0	1.000	0.07
SC-115	Nitrate	6	3	0.38	0.720	0.2
SC-117	Nitrate	8	13	1.48	0.142	0.46
SC-118	Nitrate	8	7	0.74	0.472	0.25
SC-119	Nitrate	7	14	1.95	0.050	0.67
SC-120	Nitrate	9	17	1.67	0.098	0.47
SC-121	Nitrate	8	1	0	1.000	0.04
SC-122	Nitrate	6	8	1.32	0.204	0.53
SC-123	Nitrate	6	3	0.38	0.720	0.2
SC-125	Nitrate	8	7	0.74	0.472	0.25
SC-126	Nitrate	10	-1	0	1.000	-0.02
SC-127	Nitrate	8	10	1.11	0.276	0.36
SC-128	Nitrate	8	-7	-0.74	0.472	-0.25
SC-129	Nitrate	8	3	0.25	0.812	0.11
SC-130	Nitrate	6	9	1.5	0.136	0.6
SC-131	Nitrate	6	8	1.32	0.204	0.53
SC-132	Nitrate	5	-7	-1.47	0.158	-0.7
SC-133	Nitrate	7	-7	-0.9	0.382	-0.33
SC-134	Nitrate	5	-9	-1.96	0.050	-0.9
SC-135	Nitrate	7	9	1.2	0.238	0.43
SC-136	Nitrate	6	5	0.75	0.470	0.33
SC-137	Nitrate	6	11	1.88	0.056	0.73
SC-139	Nitrate	4	0	0	1.000	0
SC-140	Nitrate	33	2	0.02	0.988	0
SC-142	Nitrate	9	8	0.73	0.476	0.22
SC-143	Nitrate	10	9	0.72	0.484	0.2
SC-144	Nitrate	8	-8	-0.87	0.398	-0.29
SC-145	Nitrate	5	8	1.71	0.084	0.8
SC-146	Nitrate	7	14	1.95	0.050	0.67
SC-147	Nitrate	4	-4	-1.02	0.334	-0.67
SC-148	Nitrate	7	-1	0	1.000	-0.05
SC-149	Nitrate	8	1	0	1.000	0.04
SC-150	Nitrate	8	9	0.99	0.336	0.32
SC-151	Nitrate	7	8	1.05	0.310	0.38

Masked Well ID	Constituent	n	S	z	*p* value	τ
Santa Clara Subbasin (continued)						
SC-152	Nitrate	5	0	0	1.184	0
SC-153	Nitrate	8	-6	-0.62	0.548	-0.21
SC-154	Nitrate	7	6	0.75	0.472	0.29
SC-156	Nitrate	8	-6	-0.62	0.548	-0.21
SC-157	Nitrate	8	6	0.62	0.548	0.21
SC-158	Nitrate	4	-1	0	1.000	-0.17
SC-159	Nitrate	6	-2	-0.19	0.860	-0.13
SC-161	Nitrate	5	-4	-0.73	0.484	-0.4
SC-162	Nitrate	4	-6	-1.7	0.084	-1
SC-163	Nitrate	6	7	1.13	0.272	0.47
SC-164	Nitrate	10	-12	-0.98	0.336	-0.27
SC-165	Nitrate	16	-40	-1.76	0.078	-0.33
SC-166	Nitrate	16	-8	-0.32	0.756	-0.07
SC-167	Nitrate	7	7	0.9	0.382	0.33
SC-168	Nitrate	4	-1	0	1.000	-0.17
SC-169	Nitrate	29	-66	-1.22	0.224	-0.16
SC-170	Nitrate	10	-15	-1.25	0.216	-0.33
SC-171	Nitrate	9	-6	-0.52	0.612	-0.17
SC-172	Nitrate	8	7	0.74	0.472	0.25
SC-173	Nitrate	16	-4	-0.14	0.894	-0.03
SC-174	Nitrate	8	0	0	1.096	0
SC-175	Nitrate	7	-3	-0.3	0.772	-0.14
SC-176	Nitrate	8	4	0.37	0.720	0.14
SC-177	Nitrate	7	-1	0	1.000	-0.05
SC-178	Nitrate	9	1	0	1.000	0.03
SC-179	Nitrate	7	-4	-0.45	0.666	-0.19
SC-180	Nitrate	8	-6	-0.62	0.548	-0.21
SC-181	Nitrate	7	-7	-0.9	0.382	-0.33
SC-182	Nitrate	10	0	0	1.072	0
SC-183	Nitrate	6	-6	-0.94	0.370	-0.4
SC-184	Nitrate	7	-2	-0.15	0.886	-0.1
SC-185	Nitrate	4	-6	-1.7	0.084	-1
SC-186	Nitrate	11	-17	-1.25	0.218	-0.31
SC-187	Nitrate	9	-4	-0.31	0.762	-0.11
SC-188	Nitrate	8	8	0.87	0.398	0.29
SC-189	Nitrate	9	3	0.21	0.840	0.08
SC-190	Nitrate	4	5	1.36	0.208	0.83
SC-191	Nitrate	4	0	0	1.250	0
SC-192	Nitrate	4	4	1.02	0.334	0.67
SC-193	Nitrate	5	-1	0	1.000	-0.1
SC-194	Nitrate	8	9	0.99	0.336	0.32
SC-195	Nitrate	12	-5	-0.27	0.788	-0.08
SC-196	Nitrate	9	10	0.94	0.358	0.28
SC-197	Nitrate	8	4	0.37	0.720	0.14
SC-198	Nitrate	8	5	0.49	0.634	0.18
SC-200	Nitrate	5	-1	0	1.000	-0.1
SC-201	Nitrate	4	-3	-0.68	0.542	-0.5
SC-202	Nitrate	5	4	1.06	0.484	0.4
SC-204	Nitrate	5	0	0	1.000	0
SC-205	Nitrate	4	0	0	1.250	0
SC-206	Nitrate	6	9	1.5	0.136	0.6
SC-207	Nitrate	18	3	0.08	0.940	0.02
SC-209	Nitrate	37	102	1.32	0.188	0.15
SC-210	Nitrate	30	-20	-0.34	0.736	-0.05
SC-211	Nitrate	29	40	0.73	0.468	0.1
SC-212	Nitrate	38	81	1.01	0.316	0.12
SC-213	Nitrate	20	26	0.81	0.422	0.14

Masked Well ID	Constituent	n	S	z	*p* value	τ
Santa Clara Subbasin (continued)						
SC-214	Nitrate	21	45	1.33	0.186	0.21
SC-217	Nitrate	11	15	1.09	0.282	0.27
SC-218	Nitrate	10	17	1.43	0.156	0.38
SC-219	Nitrate	21	-60	-1.78	0.074	-0.29
SC-220	Nitrate	24	-77	-1.89	0.058	-0.28
SC-221	Nitrate	27	-47	-0.96	0.340	-0.13
SC-222	Nitrate	28	52	1.01	0.316	0.14
SC-223	Nitrate	7	-4	-0.45	0.666	-0.19
SC-224	Nitrate	11	21	1.56	0.120	0.38
SC-225	Nitrate	7	-8	-1.05	0.310	-0.38
SC-226	Nitrate	7	3	0.3	0.772	0.14
SC-227	Nitrate	8	15	1.73	0.084	0.54
SC-228	Nitrate	9	-3	-0.21	0.840	-0.08
SC-229	Nitrate	4	4	1.02	0.334	0.67
SC-231	Nitrate	18	-51	-1.89	0.058	-0.33
SC-233	Nitrate	6	5	0.75	0.470	0.33
SC-234	Nitrate	7	-5	-0.6	0.562	-0.24
SC-235	Nitrate	7	-7	-0.9	0.382	-0.33
SC-236	Nitrate	8	-14	-1.61	0.108	-0.5
SC-237	Nitrate	8	3	0.25	0.812	0.11
SC-239	Nitrate	8	-10	-1.11	0.276	-0.36
SC-241	Nitrate	8	2	0.12	0.904	0.07
SC-242	Nitrate	5	3	0.49	0.650	0.3
SC-243	Nitrate	9	-4	-0.31	0.762	-0.11
SC-245	Nitrate	6	-9	-1.5	0.136	-0.6
SC-246	Nitrate	7	-2	-0.15	0.886	-0.1
SC-247	Nitrate	8	-10	-1.11	0.276	-0.36
SC-248	Nitrate	8	0	0	1.096	0
SC-251	Nitrate	8	-5	-0.49	0.634	-0.18
SC-252	Nitrate	9	-15	-1.46	0.150	-0.42
SC-253	Nitrate	7	-9	-1.2	0.238	-0.43
SC-254	Nitrate	8	1	0	1.000	0.04
SC-255	Nitrate	7	-14	-1.95	0.050	-0.67
SC-1	Total dissolved solids	7	-3	-0.3	0.772	-0.14
SC-3	Total dissolved solids	4	-4	-1.02	0.334	-0.67
SC-4	Total dissolved solids	4	-6	-1.7	0.084	-1
SC-5	Total dissolved solids	5	-3	-0.49	0.650	-0.3
SC-6	Total dissolved solids	6	5	0.75	0.470	0.33
SC-11	Total dissolved solids	6	-2	-0.19	0.860	-0.13
SC-14	Total dissolved solids	8	-4	-0.37	0.720	-0.14
SC-18	Total dissolved solids	9	-16	-1.56	0.120	-0.44
SC-27	Total dissolved solids	5	-9	-1.96	0.050	-0.9
SC-33	Total dissolved solids	9	-12	-1.15	0.260	-0.33
SC-34	Total dissolved solids	5	0	0	1.184	0
SC-35	Total dissolved solids	6	-1	0	1.000	-0.07
SC-38	Total dissolved solids	5	-8	-1.71	0.084	-0.8
SC-39	Total dissolved solids	4	-6	-1.7	0.084	-1
SC-40	Total dissolved solids	6	-7	-1.13	0.272	-0.47
SC-41	Total dissolved solids	6	-10	-1.69	0.096	-0.67
SC-42	Total dissolved solids	4	0	0	1.250	0
SC-46	Total dissolved solids	4	0	0	1.250	0
SC-47	Total dissolved solids	9	9	0.83	0.416	0.25
SC-48	Total dissolved solids	9	-4	-0.31	0.762	-0.11
SC-49	Total dissolved solids	6	-3	-0.38	0.720	-0.2
SC-50	Total dissolved solids	4	6	1.7	0.084	1
SC-52	Total dissolved solids	8	-2	-0.12	0.904	-0.07
SC-55	Total dissolved solids	4	4	1.02	0.334	0.67

Masked Well ID	Constituent	n	S	z	*p* value	τ
Santa Clara Subbasin (continued)						
SC-57	Total dissolved solids	8	-5	-0.49	0.634	-0.18
SC-58	Total dissolved solids	6	11	1.88	0.056	0.73
SC-61	Total dissolved solids	4	2	0.34	0.750	0.33
SC-62	Total dissolved solids	6	4	0.56	0.594	0.27
SC-63	Total dissolved solids	4	-1	0	1.000	-0.17
SC-64	Total dissolved solids	7	-4	-0.45	0.666	-0.19
SC-67	Total dissolved solids	8	-5	-0.49	0.634	-0.18
SC-74	Total dissolved solids	7	-6	-0.75	0.472	-0.29
SC-77	Total dissolved solids	4	-1	0	1.000	-0.17
SC-78	Total dissolved solids	4	0	0	1.250	0
SC-79	Total dissolved solids	4	4	1.02	0.334	0.67
SC-81	Total dissolved solids	4	-4	-1.02	0.334	-0.67
SC-82	Total dissolved solids	6	-9	-1.5	0.136	-0.6
SC-84	Total dissolved solids	4	2	0.34	0.750	0.33
SC-85	Total dissolved solids	6	-3	-0.38	0.720	-0.2
SC-86	Total dissolved solids	6	5	0.75	0.470	0.33
SC-87	Total dissolved solids	5	-4	-0.73	0.484	-0.4
SC-88	Total dissolved solids	6	3	0.38	0.720	0.2
SC-89	Total dissolved solids	7	-11	-1.5	0.136	-0.52
SC-90	Total dissolved solids	6	7	1.13	0.272	0.47
SC-91	Total dissolved solids	4	6	1.7	0.084	1
SC-92	Total dissolved solids	4	-2	-0.34	0.750	-0.33
SC-93	Total dissolved solids	4	1	0	1.000	0.17
SC-95	Total dissolved solids	5	-7	-1.47	0.158	-0.7
SC-102	Total dissolved solids	4	0	0	1.250	0
SC-103	Total dissolved solids	4	2	0.34	0.750	0.33
SC-105	Total dissolved solids	7	-3	-0.3	0.772	-0.14
SC-106	Total dissolved solids	6	1	0	1.000	0.07
SC-107	Total dissolved solids	5	-1	0	1.000	-0.1
SC-108	Total dissolved solids	6	-5	-0.75	0.470	-0.33
SC-109	Total dissolved solids	5	-2	-0.24	0.816	-0.2
SC-123	Total dissolved solids	5	-2	-0.24	0.816	-0.2
SC-124	Total dissolved solids	5	0	0	1.184	0
SC-126	Total dissolved solids	4	-2	-0.34	0.750	-0.33
SC-131	Total dissolved solids	4	5	1.36	0.208	0.83
SC-132	Total dissolved solids	4	0	0	1.250	0
SC-133	Total dissolved solids	4	-1	0	1.000	-0.17
SC-139	Total dissolved solids	4	-3	-0.68	0.542	-0.5
SC-140	Total dissolved solids	4	-1	0	1.000	-0.17
SC-141	Total dissolved solids	9	-3	-0.21	0.840	-0.08
SC-142	Total dissolved solids	4	4	1.02	0.334	0.67
SC-146	Total dissolved solids	4	2	0.34	0.750	0.33
SC-148	Total dissolved solids	4	6	1.7	0.084	1
SC-153	Total dissolved solids	4	0	0	1.250	0
SC-160	Total dissolved solids	4	-1	0	1.000	-0.17
SC-162	Total dissolved solids	5	2	0.24	0.816	0.2
SC-163	Total dissolved solids	7	-10	-1.35	0.186	-0.48
SC-169	Total dissolved solids	4	-1	0	1.000	-0.17
SC-179	Total dissolved solids	4	0	0	1.250	0
SC-186	Total dissolved solids	6	0	0	1.154	0
SC-191	Total dissolved solids	4	-2	-0.34	0.750	-0.33
SC-192	Total dissolved solids	4	2	0.34	0.750	0.33
SC-193	Total dissolved solids	5	-4	-0.73	0.484	-0.4
SC-195	Total dissolved solids	6	0	0	1.154	0
SC-199	Total dissolved solids	4	4	1.02	0.334	0.67
SC-200	Total dissolved solids	6	3	0.38	0.720	0.2
SC-201	Total dissolved solids	5	-2	-0.24	0.816	-0.2

Masked Well ID	Constituent	n	S	z	*p* value	τ
Santa Clara Subbasin (continued)						
SC-202	Total dissolved solids	6	1	0	1.000	0.07
SC-203	Total dissolved solids	4	0	0	1.250	0
SC-204	Total dissolved solids	5	2	0.24	0.816	0.2
SC-205	Total dissolved solids	4	0	0	1.250	0
SC-206	Total dissolved solids	6	5	0.75	0.470	0.33
SC-213	Total dissolved solids	4	2	0.34	0.750	0.33
SC-214	Total dissolved solids	4	2	0.34	0.750	0.33
SC-216	Total dissolved solids	4	-4	-1.02	0.334	-0.67
SC-218	Total dissolved solids	4	2	0.34	0.750	0.33
SC-219	Total dissolved solids	4	-3	-0.68	0.542	-0.5
SC-220	Total dissolved solids	8	-3	-0.25	0.812	-0.11
SC-224	Total dissolved solids	4	-4	-1.02	0.334	-0.67
SC-226	Total dissolved solids	7	3	0.3	0.772	0.14
SC-229	Total dissolved solids	4	4	1.02	0.334	0.67
SC-238	Total dissolved solids	4	-4	-1.02	0.334	-0.67
SC-239	Total dissolved solids	4	-4	-1.02	0.334	-0.67
SC-240	Total dissolved solids	5	-9	-1.96	0.050	-0.9
SC-241	Total dissolved solids	4	-4	-1.02	0.334	-0.67
SC-243	Total dissolved solids	5	-5	-0.98	0.358	-0.5
SC-244	Total dissolved solids	4	-6	-1.7	0.084	-1
SC-248	Total dissolved solids	8	13	1.48	0.142	0.46
Coyote Subbasin						
C-6	Chloride	8	14	1.61	0.108	0.5
C-9	Chloride	4	2	0.34	0.750	0.33
C-10	Chloride	4	4	1.02	0.334	0.67
C-12	Chloride	4	3	0.68	0.542	0.5
C-14	Chloride	7	0	0	1.126	0
C-17	Chloride	8	1	0	1.000	0.04
C-19	Chloride	4	-2	-0.34	0.750	-0.33
C-21	Chloride	4	0	0	1.250	0
C-22	Chloride	4	-3	-0.68	0.542	-0.5
C-23	Chloride	4	-3	-0.68	0.542	-0.5
C-26	Chloride	8	-15	-1.73	0.084	-0.54
C-1	Nitrate	5	-9	-1.96	0.050	-0.9
C-2	Nitrate	6	-2	-0.19	0.860	-0.13
C-3	Nitrate	8	1	0	1.000	0.04
C-4	Nitrate	6	-1	0	1.000	-0.07
C-5	Nitrate	6	3	0.38	0.720	0.2
C-6	Nitrate	12	22	1.44	0.152	0.33
C-7	Nitrate	7	-3	-0.3	0.772	-0.14
C-8	Nitrate	18	-46	-1.7	0.088	-0.3
C-9	Nitrate	4	-2	-0.34	0.750	-0.33
C-13	Nitrate	5	-6	-1.22	0.234	-0.6
C-14	Nitrate	7	-1	0	1.000	-0.05
C-17	Nitrate	15	23	1.09	0.282	0.22
C-21	Nitrate	10	5	0.36	0.728	0.11
C-23	Nitrate	4	0	0	1.000	0
C-24	Nitrate	11	23	1.71	0.086	0.42
C-25	Nitrate	4	3	0.68	0.542	0.5
C-26	Nitrate	13	-15	-0.85	0.402	-0.19
C-9	Total dissolved solids	4	-1	0	1.000	-0.17
C-10	Total dissolved solids	4	0	0	1.250	0
C-14	Total dissolved solids	7	5	0.6	0.562	0.24
C-17	Total dissolved solids	8	-4	-0.37	0.720	-0.14
C-19	Total dissolved solids	4	4	1.02	0.334	0.67
C-21	Total dissolved solids	4	0	0	1.250	0
C-22	Total dissolved solids	4	2	0.34	0.750	0.33

Masked Well ID	Constituent	n	S	z	*p* value	τ
		Coyote Subbasin (continued)				
C-23	Total dissolved solids	4	-2	-0.34	0.750	-0.33
C-26	Total dissolved solids	8	-4	-0.37	0.720	-0.14
		Llagas Subbasin				
L-1	Chloride	4	-4	-1.02	0.334	-0.67
L-2	Chloride	4	0	0	1.250	0
L-4	Chloride	6	-2	-0.19	0.860	-0.13
L-6	Chloride	5	-2	-0.24	0.816	-0.2
L-7	Chloride	4	2	0.34	0.750	0.33
L-8	Chloride	4	4	1.02	0.334	0.67
L-9	Chloride	4	2	0.34	0.750	0.33
L-10	Chloride	4	0	0	1.250	0
L-11	Chloride	4	2	0.34	0.750	0.33
L-12	Chloride	4	4	1.02	0.334	0.67
L-18	Chloride	5	6	1.22	0.234	0.6
L-19	Chloride	6	-2	-0.19	0.860	-0.13
L-20	Chloride	4	1	0	1.000	0.17
L-23	Chloride	4	5	1.36	0.208	0.83
L-24	Chloride	5	6	1.22	0.234	0.6
L-25	Chloride	5	6	1.22	0.234	0.6
L-29	Chloride	7	8	1.05	0.310	0.38
L-32	Chloride	6	4	0.56	0.594	0.27
L-38	Chloride	6	0	0	1.154	0
L-40	Chloride	4	1	0	1.000	0.17
L-47	Chloride	6	1	0	1.000	0.07
L-54	Chloride	4	5	1.36	0.208	0.83
L-56	Chloride	5	6	1.22	0.234	0.6
L-60	Chloride	7	1	0	1.000	0.05
L-62	Chloride	7	0	0	1.126	0
L-64	Chloride	7	4	0.45	0.666	0.19
L-65	Chloride	5	-1	0	1.000	-0.1
L-73	Chloride	5	0	0	1.184	0
L-75	Chloride	7	-12	-1.65	0.102	-0.57
L-79	Chloride	8	2	0.12	0.904	0.07
L-88	Chloride	5	-3	-0.49	0.650	-0.3
L-97	Chloride	8	3	0.25	0.812	0.11
L-98	Chloride	5	-1	0	1.000	-0.1
L-100	Chloride	10	-5	-0.36	0.728	-0.11
L-101	Chloride	4	0	0	1.250	0
L-102	Chloride	7	-3	-0.3	0.772	-0.14
L-103	Chloride	4	4	1.02	0.334	0.67
L-112	Chloride	4	0	0	1.250	0
L-113	Chloride	5	-2	-0.24	0.816	-0.2
L-114	Chloride	5	-4	-0.73	0.484	-0.4
L-1	Nitrate	4	-6	-1.7	0.084	-1
L-2	Nitrate	15	-25	-1.19	0.240	-0.24
L-3	Nitrate	13	4	0.18	0.858	0.05
L-4	Nitrate	6	-9	-1.5	0.136	-0.6
L-10	Nitrate	10	-4	-0.27	0.794	-0.09
L-11	Nitrate	9	-5	-0.42	0.686	-0.14
L-12	Nitrate	10	2	0.09	0.930	0.04
L-13	Nitrate	15	-32	-1.62	0.104	-0.3
L-14	Nitrate	19	-1	0	1.000	-0.01
L-15	Nitrate	15	13	0.59	0.558	0.12
L-16	Nitrate	9	-8	-0.73	0.476	-0.22
L-17	Nitrate	27	-14	-0.27	0.788	-0.04
L-20	Nitrate	9	-3	-0.21	0.840	-0.08

Masked Well ID	Constituent	n	S	z	*p* value	τ
Llagas Subbasin (continued)						
L-22	Nitrate	6	-11	-1.88	0.056	-0.73
L-24	Nitrate	13	-16	-0.92	0.368	-0.21
L-28	Nitrate	15	-5	-0.2	0.846	-0.05
L-29	Nitrate	7	3	0.3	0.772	0.14
L-32	Nitrate	6	3	0.38	0.720	0.2
L-33	Nitrate	5	-6	-1.22	0.234	-0.6
L-34	Nitrate	10	10	0.8	0.432	0.22
L-35	Nitrate	5	-3	-0.49	0.650	-0.3
L-37	Nitrate	10	12	0.98	0.336	0.27
L-38	Nitrate	6	-5	-0.75	0.470	-0.33
L-39	Nitrate	13	-25	-1.46	0.146	-0.32
L-41	Nitrate	8	-4	-0.37	0.720	-0.14
L-42	Nitrate	8	7	0.74	0.472	0.25
L-43	Nitrate	13	8	0.43	0.676	0.1
L-44	Nitrate	9	9	0.83	0.416	0.25
L-45	Nitrate	6	-6	-0.94	0.370	-0.4
L-46	Nitrate	11	5	0.31	0.762	0.09
L-47	Nitrate	6	3	0.38	0.720	0.2
L-48	Nitrate	8	-8	-0.87	0.398	-0.29
L-49	Nitrate	14	-2	-0.05	0.956	-0.02
L-50	Nitrate	14	-31	-1.64	0.100	-0.34
L-51	Nitrate	11	-19	-1.4	0.164	-0.35
L-52	Nitrate	14	-1	0	1.000	-0.01
L-54	Nitrate	8	5	0.49	0.634	0.18
L-55	Nitrate	15	-9	-0.4	0.698	-0.09
L-56	Nitrate	5	4	0.73	0.484	0.4
L-57	Nitrate	12	3	0.14	0.892	0.05
L-58	Nitrate	7	11	1.5	0.136	0.52
L-59	Nitrate	21	-23	-0.66	0.510	-0.11
L-60	Nitrate	14	28	1.48	0.142	0.31
L-61	Nitrate	7	7	0.9	0.382	0.33
L-62	Nitrate	12	-7	-0.41	0.688	-0.11
L-63	Nitrate	8	-11	-1.24	0.226	-0.39
L-65	Nitrate	5	0	0	1.000	0
L-66	Nitrate	15	34	1.63	0.102	0.32
L-67	Nitrate	37	60	0.77	0.444	0.09
L-68	Nitrate	14	7	0.33	0.100	0.08
L-69	Nitrate	14	21	1.09	0.280	0.23
L-70	Nitrate	14	-31	-1.64	0.100	-0.34
L-71	Nitrate	13	7	0.59	0.556	0.09
L-72	Nitrate	34	131	1.93	0.054	0.23
L-77	Nitrate	4	-2	-0.34	0.750	-0.33
L-78	Nitrate	4	-2	-0.34	0.750	-0.33
L-81	Nitrate	4	1	0	1.000	0.17
L-83	Nitrate	35	-87	-1.22	0.224	-0.15
L-84	Nitrate	13	6	0.67	0.504	0.08
L-85	Nitrate	13	6	0.67	0.504	0.08
L-86	Nitrate	13	-22	-1.28	0.204	-0.28
L-87	Nitrate	13	-18	-1.04	0.306	-0.23
L-88	Nitrate	38	-123	-1.53	0.126	-0.17
L-89	Nitrate	38	90	1.12	0.264	0.13
L-90	Nitrate	35	-132	-1.86	0.062	-0.22
L-93	Nitrate	13	6	0.67	0.504	0.08
L-94	Nitrate	12	5	0.58	0.562	0.08
L-95	Nitrate	14	11	0.55	0.590	0.12
L-96	Nitrate	7	-3	-0.3	0.772	-0.14
L-97	Nitrate	8	-2	-0.12	0.904	-0.07

Masked Well ID	Constituent	n	S	z	*p* value	τ
Llagas Subbasin (continued)						
L-98	Nitrate	5	0	0	1.184	0
L-99	Nitrate	15	-5	-0.34	0.734	-0.05
L-100	Nitrate	15	39	1.88	0.058	0.37
L-101	Nitrate	4	6	1.7	0.084	1
L-102	Nitrate	15	-29	-1.39	0.168	-0.28
L-103	Nitrate	4	4	1.02	0.334	0.67
L-104	Nitrate	7	-12	-1.65	0.102	-0.57
L-105	Nitrate	8	15	1.73	0.084	0.54
L-106	Nitrate	10	-16	-1.34	0.186	-0.36
L-107	Nitrate	11	-4	-0.23	0.820	-0.07
L-108	Nitrate	8	-12	-1.36	0.178	-0.43
L-110	Nitrate	13	-1	0	1.000	-0.01
L-111	Nitrate	19	-33	-1.12	0.266	-0.19
L-112	Nitrate	14	-11	-0.55	0.590	-0.12
L-113	Nitrate	5	-2	-0.24	0.816	-0.2
L-114	Nitrate	5	-8	-1.71	0.084	-0.8
L-1	Total dissolved solids	4	2	0.34	0.750	0.33
L-2	Total dissolved solids	4	-4	-1.02	0.334	-0.67
L-4	Total dissolved solids	6	3	0.38	0.720	0.2
L-6	Total dissolved solids	5	1	0	1.000	0.1
L-7	Total dissolved solids	4	-3	-0.68	0.542	-0.5
L-8	Total dissolved solids	4	-4	-1.02	0.334	-0.67
L-9	Total dissolved solids	4	0	0	1.250	0
L-10	Total dissolved solids	4	2	0.34	0.750	0.33
L-11	Total dissolved solids	4	2	0.34	0.750	0.33
L-12	Total dissolved solids	4	-5	-1.36	0.208	-0.83
L-18	Total dissolved solids	5	6	1.22	0.234	0.6
L-19	Total dissolved solids	6	-1	0	1.000	-0.07
L-20	Total dissolved solids	4	4	1.02	0.334	0.67
L-23	Total dissolved solids	4	-2	-0.34	0.750	-0.33
L-24	Total dissolved solids	5	-1	0	1.000	-0.1
L-25	Total dissolved solids	5	5	0.98	0.358	0.5
L-29	Total dissolved solids	7	-2	-0.15	0.886	-0.1
L-32	Total dissolved solids	6	1	0	1.000	0.07
L-38	Total dissolved solids	6	3	0.38	0.720	0.2
L-40	Total dissolved solids	4	-4	-1.02	0.334	-0.67
L-45	Total dissolved solids	4	0	0	1.250	0
L-47	Total dissolved solids	6	9	1.5	0.136	0.6
L-54	Total dissolved solids	4	5	1.36	0.208	0.83
L-56	Total dissolved solids	5	2	0.24	0.816	0.2
L-60	Total dissolved solids	7	3	0.3	0.772	0.14
L-62	Total dissolved solids	7	-3	-0.3	0.772	-0.14
L-64	Total dissolved solids	8	16	1.86	0.062	0.57
L-65	Total dissolved solids	5	2	0.24	0.816	0.2
L-73	Total dissolved solids	5	-4	-0.73	0.484	-0.4
L-75	Total dissolved solids	8	-4	-0.37	0.720	-0.14
L-77	Total dissolved solids	4	4	1.02	0.334	0.67
L-78	Total dissolved solids	4	4	1.02	0.334	0.67
L-79	Total dissolved solids	8	4	0.37	0.720	0.14
L-80	Total dissolved solids	9	18	1.77	0.076	0.5
L-88	Total dissolved solids	5	6	1.22	0.234	0.6
L-97	Total dissolved solids	8	-2	-0.12	0.904	-0.07
L-98	Total dissolved solids	5	1	0	1.000	0.1
L-100	Total dissolved solids	10	4	0.27	0.794	0.09
L-101	Total dissolved solids	4	-5	-1.36	0.208	-0.83
L-102	Total dissolved solids	7	-1	0	1.000	-0.05
L-103	Total dissolved solids	4	4	1.02	0.334	0.67

Masked Well ID	Constituent	n	S	z	*p* value	τ
Llagas Subbasin (continued)						
L-111	Total dissolved solids	11	-9	-0.62	0.542	-0.16
L-112	Total dissolved solids	4	4	1.02	0.334	0.67
L-113	Total dissolved solids	5	-4	-0.73	0.484	-0.4
L-114	Total dissolved solids	5	-6	-1.22	0.234	-0.6

Notes: n = number of data records; S = Mann-Kendall test statistic, z = Mann-Kendall statistic (S) converted to test statistic that is approximated by a normal distribution; *p* value = probability of getting the observed value of τ, or one more extreme, when the null hypothesis is true; τ = Kendall's tau (correlation coefficient); magnitude of trend = median slope of all pair-wise slopes.

Appendix E. Trend Testing Process

The simple (non-seasonal) Mann-Kendall test is a nonparametric test used to detect possible single direction trends in water quality constituents over time at individual well sites. Kendall's tau (τ) provides a measure of the strength of association between two continuous variables and a means to test the significance of that association. A test statistic is computed from the data then compared to zero. If the test statistic is unusually larger or smaller than zero, then the probability of trend in the data is high and trend is asserted. If the test statistic is approximately equal to zero, then a conclusion of "no trend" is reached. The direction in trend is measured by the sign of τ, with positive values indicating an upward trend and negative values indicating a downward trend in concentrations. The confidence level for this trend evaluation is equal to 95% (α=0.05).

For sites having a statistically significant ($p < 0.05$) detectable trend, the magnitude of the trend is also estimated from the data pairs. The magnitude is actually the trend slope or rate at which concentration is increasing or decreasing over time. The slope is the median slope of all pair-wise comparisons of the concentration data. Each pair-wise difference in concentration is divided by the number of years separating them. For sites having significant detectable upward and downward trends, results of the trend testing procedure along with the magnitude of trend are presented in Appendix B and C, respectively.